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Vol. 156, No. 10 September 6, 1945

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The IRON AGE

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Butter From Coal and Steel From Milk

"I SEE by the papers," as the estimable Mr. Dooley used to say, that the Germans had discovered how to make butter from coal. Some people will probably jump to the conclusions that the days of the cow and of the milkmaid are numbered and that the chief function of the bovines hereafter will be to hang on beef hooks in butcher shops, at least until science finds a way to produce synthetic steaks from sawdust or other plentiful material.

Personally, I don't think there is much danger of that. I haven't tasted underground butter as yet, but even if it were as good as margarine, it won't put the milch cow out of business. Things just do not work out that way, fortunately for most of us. And cows are more obedient to the demands of the public than are coal miners. I should hate to see John Lewis in control of the contents of our baby bottles.

After all, one good thing usually helps another, especially in the field of materials. During the past fifty years, thousands upon thousands of new materials have been discovered and produced. Some of them were going to put the steel companies out of business, but so far they haven't. And I defy you to name any one widely used material of fifty years ago that is not produced and used today in even greater proportion per capita, which is the only way to measure it.

Over a year ago an eminent chemist speaking before the American Chemical Society revealed the astonishing fact that since Pearl Harbor more than 2000 new materials, or materials hitherto unusable because of their rarity, had been discovered or developed to the availability stage. Think of that!

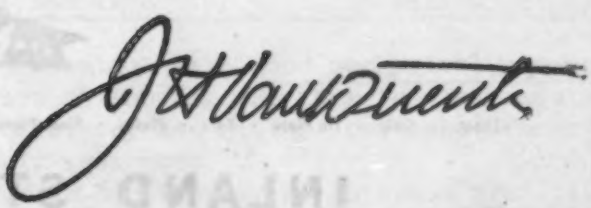
And every one of them contains iron and steel.

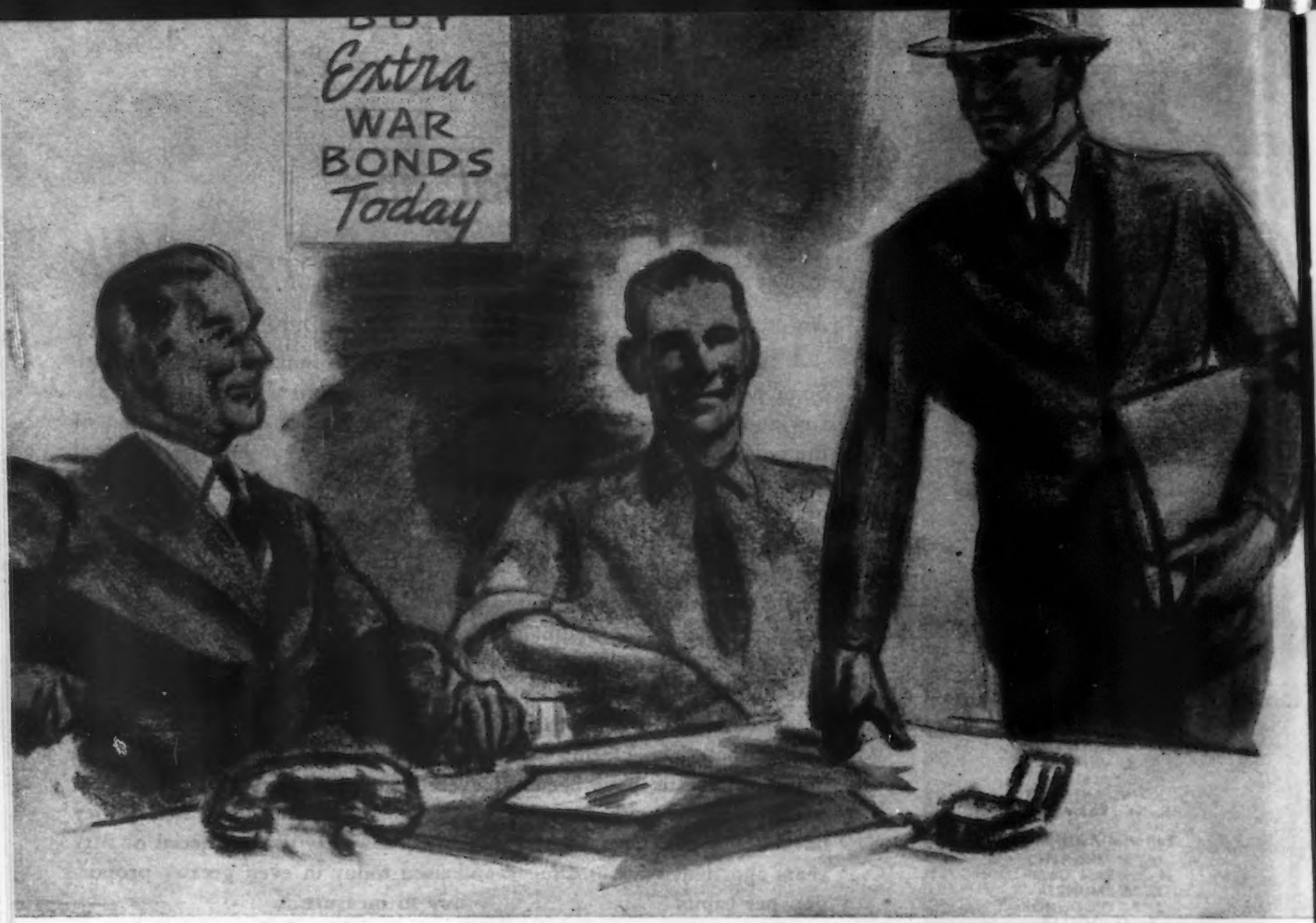
Butter from coal. Would you be surprised if I told you that every quart of milk has steel in it? And aluminum, brass, sand and paint also.

Steel in milk? How about the steel wire in the dairy farm fences or the sheet steel in the milk cans or in the railroad tracks and equipment that transport it? Or in the factories making milk products? How about sand in the glass milk bottles and paint on the milk wagons?

Yes, indeed, there is some steel and iron in every other good material. An indirect content, of course, but a most sizable one. That is why we are content to remain, as we always have been, THE IRON AGE. As long as alphabets remain the most important letters in them, from the industrial standpoint, will be Fe.

Our industry should welcome the 2000 newcomers who have joined the procession of materials. For each one of them, in its production, distribution and use, will call on its elder brother for support.





Metal-wise Men of Inland Ready to Help You

Visit any of Inland's properties and you will meet men who live and work with steel—they are the metal-wise men of Inland. They will be found at mines and quarries, using their special training and skill in assembling selected raw materials —ore, coal, and limestone.

Only metal-wise men operate the Inland blast furnaces, open hearth furnaces, and rolling mills—and staff the metallurgical and inspection departments. All are steelmakers of highest qualifications, and many of them rank high among America's foremost authorities in the production and use of steel.

Quite frequently you will meet metal-wise men of Inland helping a manufacturer solve problems of steel selection, part design, and manufacturing method. An Inland specialist, wise in the ways of making and fabricating steel, is always ready to help you.

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The IRON AGE
Sept. 4, 1945

NEWS FRONT

► French government plans call for the replacement of 265,000 of the oldest units in the machine tool industry. About 125,000 of these are expected to be imported from Great Britain, Sweden, and U. S.

DeGaulle's government envisions a new combine of the French industry in which the government would have the largest share of the capital, charged with the production of tools heretofore imported.

► Automobile dealers are afraid that the new price arrangements on new passenger cars will mean that they may get the squeeze, as retailers in other lines feel that they are.

Establishment of the price ceilings will cause a precipitous drop in used car prices, as warranted used car prices have been in many cases far above original new 1942 ceilings.

► Fisher is asking steel delivery for 15,000 car bodies a day in 1946, on the basis of a 300 day production year. Steel requirements for Fisher alone would be in the neighborhood of 1,687,500 tons.

► The British iron and steel industry has not yet started competition on European and African markets. Sweden, now in direct shipping contact with Africa and the Iberian peninsula, is dominating the market for alloy, tool steels and electrical machinery.

Of 122 blast furnaces left undamaged by the war in France and Lorraine, only 39 were in blast in July, with a daily average capacity of 270 tons.

► Despite cancellations there are still thousands of jobs to be filled on the west coast. The jobs are no longer war jobs at incomes swelled by long overtime hours.

► West Coast business men are plumping for appointment of an assistant director of OWMR for the West Coast.

► Trepanning has proved to be a valuable welding inspection tool for revealing fitup, plate condition, and preparation and procedure of the weld and at relatively low cost.

However, unlike X rays, radium or Magnaflux, trepanning is a destructive type test and covers only small areas.

► Improved surface finish is being obtained in aircraft by thermal expansion of the light-alloy skin prior to reveting. Electrically heated blankets are placed in close contact with the skin plating. The electric current passing through the blanket raises the temperature and expands the skin plating. In this heated condition the panels are drilled and riveted along the edges. After the removal of the blanket, the skin cools and becomes taut. Riveting is then completed in the normal manner and the resulting component is free from quilting and oil-can effects.

At present, only wings are so treated, but experience gained indicates that the method may be applied with advantage to all external plating, particularly in thin gages.

► In view of the better controls being introduced and more complicated shapes being cast centrifugally, the use of graphite electrode rod molds offers many advantages. Less storage space is needed; graphite is more easily machined with normal carbon steel and its rapid heat transfer aids progressive solidification.

Graphite inserts may eliminate such machining operations as hole boring, and it is within the realm of possibility that undercuts and irregular contours will eventually be cast rather than machined.

► Interest is high in a ferritic 8.5 pct nickel steel with good mechanical properties at very low temperatures, said to be as low as 200 deg. F. Now in experimental production at Lukens, this steel may offer prospect of use at the low temperatures involved in petroleum dewaxing and in liquid air equipment.

► A WPB survey of 5001 companies representing 42 key industries foresees production equal to 48 pct of a 1939-1941 average this month, 112 pct in December, and 187 pct in June of 1946.

Metals, Finishes, And Finishing Processes

o o o

By EDWARD ENGEL
Consulting Engineer, Technical Processes Division, Colonial Alloys Co., Philadelphia

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WITH the metals industry on the threshold of a dramatic swing from war production back to the innumerable varieties of civilian products, the selection of the proper metal, finish, and finishing process again becomes a matter of paramount competitive importance. Hence this complete, unique, and functional correlation of a tremendous mass of hitherto widely scattered data can be of most timely usefulness. The tabularized data which appear in this issue and the three following issues of THE IRON AGE present a general view of the metal surface processes, and they serve to supplement the "Metal Comparison Charts" which appeared in THE IRON AGE, issue of March 30, 1944. *Herein, the following data charts are presented:*

Explanation of Tables VII to XII

In reference to cleanliness there are three conditions of metal surfaces:

(1) Mechanical.
(2) Physical.
(3) Chemical cleanliness.

A mechanically clean surface signifies the absence of oils, greases, solid particle dirt and products of oxidation, but not necessarily the products of all chemical reactions.

A chemically clean surface means the presence of no chemical reaction products, foreign matter such as oil, grease, dirt or finger prints. A metal surface must wet, i.e., retain water without a break in a water film, to be considered chemically clean. Ordinarily, cleaning by means of alkaline solution treatment presents a chemically clean surface; however, there are instances where a wettable surface is obtained following a poorly compounded alkaline cleaning treatment and in spite of an apparently chemically clean surface, trouble occurs in the adhesion of the plated deposit. Under such circumstances the basis metal may be rechecked for chemical cleanliness by an immersion in a suitable dilute acid after the alkaline cleaner. If the surface of the metal does not wet following the acid dip, it signifies that the alkaline solution treatment has left deposited a difficult-to-rinse substance in the pores of the metal.

"Mechanical" Cleaning Procedures

Operations for the removal of metallic substances are:

(1) Barrel tumbling.
(2) Sand or shot blasting.
(3) Wheel or belt grinding.
(4) Scratch brushing, and with more limited results.
(5) Acid pickling.

"Physical" Cleaning Procedures

Mineral oils and greases by themselves or in mixture with other oils or substances are best removed by treatment in petroleum derivatives, referred to as mineral solvents. Mineral solvents may be of the nature of kerosene or gasoline or napthas (Red Label solvents). However, due to the fire hazards and high insurance involved in the use of Red Label solvents, "safety solvents" are preferred, i.e., solvents with a flash point of over 100° F. For small parts, chlorinated hydrocarbon solvents, generally used in a vapor form are very efficient degreasers and they are considered as having no flash point.

The removal of oils and greases by mineral solvents may also cause loosely held solid particle dirt to be removed, thus making the surface suitable for most paint applications, particularly if a finger print neutralizer is incorporated with the mineral solvent. But, under no circumstance is it to be considered that solvent cleaning or degreasing leaves a chemically clean surface and no plating will adhere to a metal surface unless it is chemically clean. In connection with degreasing, the factors to consider in an evaluation of the efficiency of a solvent are:

(1) The solvency power, i.e., the amount of oils the solvent removes before it becomes too saturated for further efficient use.

(2) The speed of solvency, i.e., the length of time required to remove the oils.

(3) The penetrating power—refers to ability of the solvent to remove oils from deep pores.

(4) The neutralization of finger prints. Finger print neutralization is very important if "painting" or a rust preventive film is to follow degreasing.

(5) In some instances it is important that there be ability to protect the surface for varying periods of time, from "rusting" and/or from fungus attack.

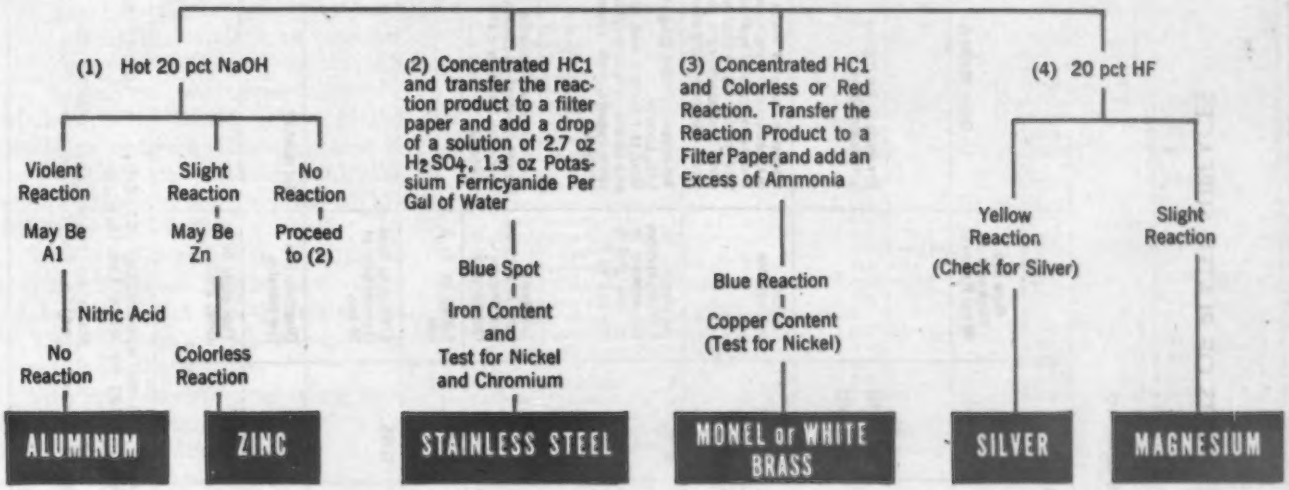
A comparatively new approach for degreasing and cleaning of metals is the use of emulsifiable solvent cleaners which are very effective and economical for the removal of heavy

TABLE I

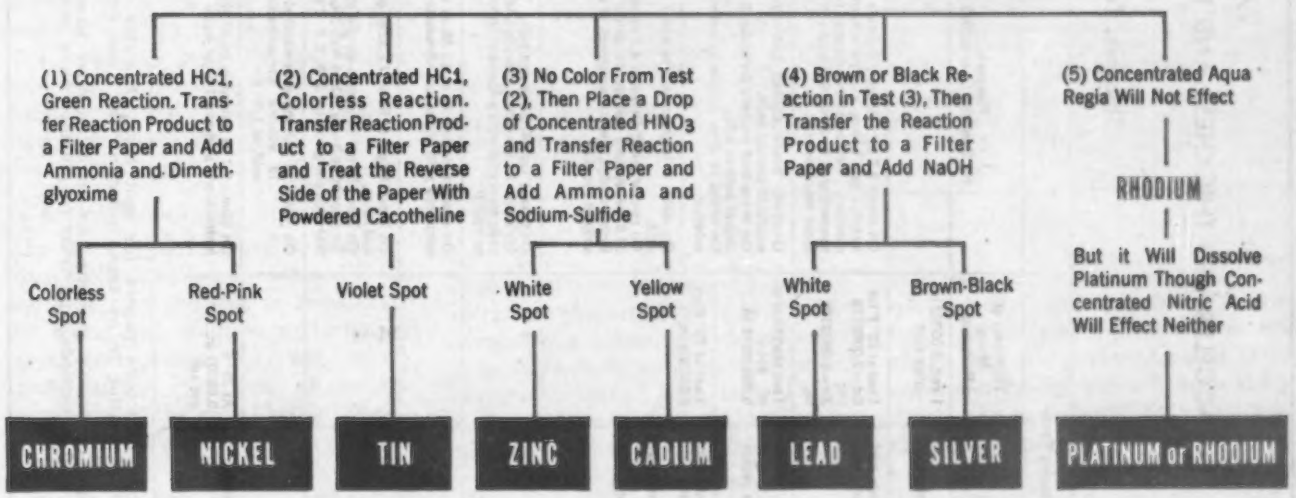
SPOT TEST IDENTIFICATION OF METAL SURFACES

Place a drop of the specified solution on the metal for 0.5 min. Sequence "A" is for testing white metals when it is not certain whether it is surface treated or not. Sequence "B" is for testing white plated surfaces, and sequence "C" is for yellow and colored metal surfaces.

SEQUENCE "A"


(1) Hot 20 pct NaOH
Violent Reaction
May Be Al
Slight Reaction
May Be Zn
No Reaction
Proceed to (2)
Nitric Acid
No Reaction
Colorless Reaction
ALUMINUM
ZINC
(2) Concentrated HCl and transfer the reaction product to a filter paper and add a drop of a solution of 2.7 oz H_2SO_4, 1.3 oz Potassium Ferricyanide Per Gal of Water
Blue Spot
Iron Content and Test for Nickel and Chromium
STAINLESS STEEL
(3) Concentrated HCl and Colorless or Red Reaction. Transfer the Reaction Product to a Filter Paper and add an Excess of Ammonia
Blue Reaction
Copper Content (Test for Nickel)
MONEL or WHITE BRASS
(4) 20 pct HF
Yellow Reaction
(Check for Silver)
Slight Reaction
SILVER
MAGNESIUM

SEQUENCE "B"


(1) Concentrated HCl, Green Reaction. Transfer Reaction Product to a Filter Paper and Add Ammonia and Dimethglyoxime
Colorless Spot
Red-Pink Spot
CHROMIUM
NICKEL
(2) Concentrated HCl, Colorless Reaction. Transfer Reaction Product to a Filter Paper and Treat the Reverse Side of the Paper With Powdered Cacotheline
Violet Spot
TIN
(3) No Color From Test (2), Then Place a Drop of Concentrated HNO_3 and Transfer Reaction to a Filter Paper and Add Ammonia and Sodium-Sulfide
White Spot
Yellow Spot
ZINC
CADIUM
(4) Brown or Black Reaction in Test (3), Then Transfer the Reaction Product to a Filter Paper and Add NaOH
White Spot
Brown-Black Spot
LEAD
SILVER
(5) Concentrated Aqua Regia Will Not Effect
RHODIUM
But it Will Dissolve Platinum Though Concentrated Nitric Acid Will Effect Neither
PLATINUM or RHODIUM

SEQUENCE "C"

Apply An Open Flame to the "Colored" Metal Surface

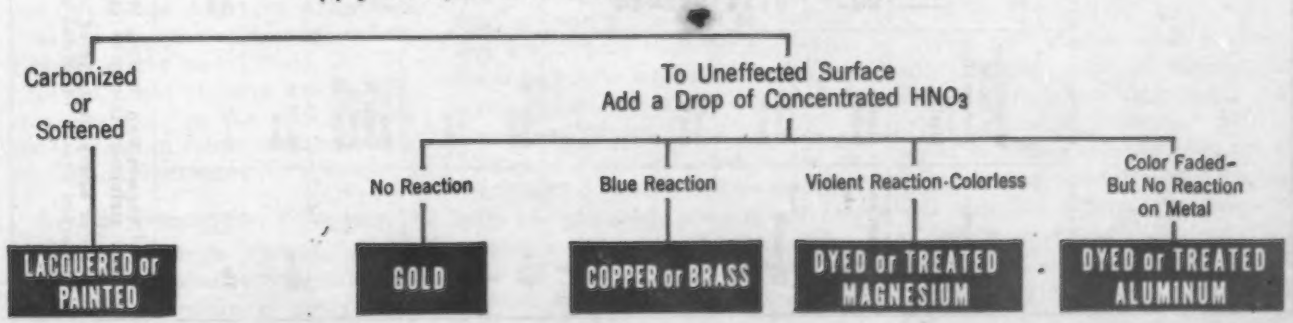


TABLE II

ACCELERATED THICKNESS AND POROSITY TESTS OF PLATED SURFACES

Thickness Testing Procedures

Deposits	Magnetic Test of Deposit Thickness On	Dropping Tests: Reagents	Dropping Tests: Thickness of Metal Removed	Stripping Tests: Reagents for Deposits Over 0.0002 in.	Stripping Tests: K	Stripping Tests: Rate and Thickness of Metal Removed	Other Methods	*Porosity Tests (Six Spots or Less Per Sq In. for a Good Plate)
Brass	Steel	1 pct Sulphuric 1 pct Potassium ferricyanide 1 liter water	1 sec, 0.00002 in. —blue spot					*20 pct salt spray
Cadmium and Zinc	Steel or Nickel	200 g per liter chromic acid 50 g per liter sulphuric acid 1 liter water	1 sec at 75° F for Cd=0.0000138 in.; Zn=0.0000102 in.	On steel: 2.7 oz antimony chloride and 1 gal of water, 1 gal (1.18 sp gr) hydrochloric acid-stock solution. 1 volume stock solution to 20 volumes concentrated hydrochloric acid (on castings use stock solution only)	Cd=0.201 Zn=0.243		Presce test but it gives unreliable results	*20 pct salt spray for Cd
Chromium	Steel or Nickel	Drop of 1.18 sp gr hydrochloric acid in ½ in. ring of wax, touch Cr with nickel wire	1 sec start to stop of gas=0.00000095 in.	On steel: Warm diluted hydrochloric acid or anodic in caustic soda. On brass and copper: Cathodic 2 min in acid copper bath at 0.2v. On nickel or zinc: Anodic in sodium carbonate solution	0.243	0.001 in. few minutes	Degrease, moisten metal with magnesium paste and rinse. Dip in concentrated hydrochloric acid containing antimony trioxide—surface darkens, gassing stops, calibrate with specimen	60 g per liter sodium chloride and 0.5 g per liter potassium ferricyanide on filter paper apply paper to metal for 10 min. Dry paper and moisten in salt solution = blue spots
Copper	Steel or Nickel	450 g per liter ferric chloride 20 g per liter antimony trioxide, 200 mg per liter concentrated hydrochloric acid 250 mg per liter acetic acid	1 sec at 75° F=0.000005 in.	On steel: 4 lb chromic acid and 7 oz sulphuric acid. On zinc or steel: Dissolve 4.3 oz sulphur in hot 34.0 oz sodium sulfide to gallon of water. Brush sludge, before weighing, in a solution of sodium cyanide	0.195	(on steel) 0.001 in. at room temperature in 20 min and 3 min at 212° F	Jet method: British Drug House, Ltd., London. Drop of 1:1 nitric acid, blot off in a second—repeat until brown stain appears, each second = 0.0001 in.	*Salt spray and moisten rag paper on one side with 50 g per liter NaCl, 50 g per liter gelatin. Dry, apply treated side to metal and moisten by brushing with 50 g per liter NaCl for 10 min, remove and immerse paper in 10 g per liter (1) potassium ferricyanide for steel, or (2) potassium ferricyanide solution for nickel base
Gold	Nickel or Steel			On brass: Quantitative analysis. On steel: 12 oz sodium cyanide and 2 oz caustic soda saturated with potassium chromate at 140° to 160° F	0.0896	(on steel) 0.001 in. at room temperature few minutes	Half-saturated alcoholic solution of dimethyl-glyoxime anodic at 6 v, weight before and after stripping	On nickel: 3 oz agar, 6 oz NaCl, 100 cc water and little ammonia, 10 cc solution alcoholic dimethyglyoxime, on filter paper and apply to metal
Lead	Steel			On steel: Solution 20 oz to 30 oz caustic soda saturated with potassium chromate at 175° F	0.153	0.0005 in. in 5 min		Special ferroxyl test: Steel: 10 g per liter K ferricyanide on filter paper 10 min blue spot
Nickel	Steel or Copper or Brass or Aluminum			On Steel: 85 pct to 95 pct (1.50 sp gr) nitric acid and rinse. On Zinc: 70 pct sulphuric-anodic at 20 A. S. F. On Copper or Brass: 13 oz $NaSCN_2$ and 0.13 oz $NaHCO_3$ per gal water at A. S. F. 3 v anodic	0.195	0.001 in. at room temperature in 20 min		* and 20 pct salt spray Modified ferroxyl test same as for copper (1) for steel bases metal (2) for brass
Silver	Nickel or Steel			On Brass: 1 volume concentrated nitric acid, 10 volume concentrated sulphuric acid, at 175° F	0.165	Dissolves in a few minutes	Jet method	Ferroxyl test—potassium ferricyanide on steel and potassium ferrocyanide on brass, or copper
Tin	Steel	Solution of trichloracetic acid, 100 g per liter	At 75° F 0.00001 in. per sec	On Steel: 2.7 oz antimony trichloride and 1 gal hydrochloric acid and 1/5 gal water	0.237	Thin coats in about 2 min		Hot water, 6 hr, no spots, good. Ammonia fumes under bell jar 4 hr, no spots (tin on brass is good. Also, for Ni on steel with hot water test)

Dropping Tests: Regular dropping test, Clarke apparatus, 100 drops ± 10 per min. "K" weigh specimen before and after stripping, thickness (in.) is weight of coating in oz times constant "K." See constant table divided by area (sq in.).

*Hanson-Van Winkle-Munning Co. offer Fotopore papers for spot tests.

For heavy deposits of nickel on copper or brass: Porosity test—moisten filter paper 50 pct $NaNO_3$ and place on metal over which place a sheet of lead or nickel. Apply 2 milliamps per sq in. Metal is the anode, lead is cathode, and treat for 30 min, then immerse paper in K ferrocyanide. Solution 50 g per liter and 30 ml per liter acetic acid = brown spots.

greases and oil and solid dirt. It is generally used by immersion at room temperature or by forced spray followed by a hot water dip or spray.

"Chemical" Cleaning Procedures

A treatment in an alkaline solution tends to present a chemically clean surface on a metal, i.e., soil and the products of most chemical reactions as well as vegetable and animal oils are removed. However, no mechanical cleaning is performed nor are mineral oils dissolved. In connection with the removal of mineral oils, it is true that an alkaline mixture may cause a thin film of oil to be removed by the heat of the solution or through the mechanical impingement of the solution or the lifting action of the dirt being removed; however, most of the mineral oil removed from the metal surface is not dissolved or absorbed by the solution.

Mineral oil removed in an alkaline solution floats on the surface of the solution as a film and the metal will be recoated with oil when it is withdrawn from the solution.

With the exception of aluminum, alkaline solutions do not tend to remove oxides or scale.

Properly compounded alkaline cleaners contain detergents. Detergents affect soil by changing it from water insoluble to water soluble, in addition to which they increase the power of a solution to wet the surface of a metal, by reducing the surface tension of the solution. Detergents also increase the penetration, rinsibility and deflocculation values (suspension of dirt).

Metal Preparation Equipment

In the use of solvents or solutions more efficient action is obtained if the liquid is in movement in relation to the metal, i.e., solution agitation by mechanical means, e.g., air, steam, forced spray operation, or by the movement of the metal being treated, or by a combination of any of these approaches.

In the instance of acid pickling of metals it has been indicated that the use of forced spray (as does the use of an acid inhibitor) tends to conserve acid, lessens the attack on the metal and minimizes hydrogen absorption, thus lowering the subsequent embrittlement of the metal.

In both acid pickling and in alkaline cleaning the electrolytic procedures result in better efficiencies than immersion treatments.

Typical Preparation Procedures

When metal is formed, drawn, stamped or worked, cooling oils and/or lubricants are almost always used. These oils must be removed between operations in order to obtain effectiveness in a subsequent operation, or in order to make an inspection, or for storage purposes. (See table IX for cutting oil, etc., data and their removal.)

In addition to the removal of the oil, it may be necessary to apply a suitable rust-preventive oil or compound, at the same time the cutting oils are removed, so the rust-preventive oils and compounds are effective. Rust preventives, as well as "paints," also are offered with fungus inhibitives, as fungus growth is one of the major causes for rapid corrosion of metals and fabrics.

As has been indicated, prior to "painting" a metal must be mechanically and physically clean in order to present a surface which will permit a bond for "paint."

Prior to plating, a metal surface must be chemically clean as well as mechanically and physically clean. Much of the metal presented to the plater has oils present, which often are removed by solvent degreasing, which may be followed by pickling or alkaline cleaning or both. The metal to be plated is usually polished after it is physically cleaned, after which it is more efficient to remove the polishing compounds by degreasing in order not to contaminate the buffing, or "coloring," which follows the polishing.

After buffing, the metal is chemically cleaned prior to plating, although vapor-phase degreasing may proceed chemical cleaning. The removal of buffing compounds is not always an easy operation as there are well over 100 different combinations of buffing compounds.

The metal should be cleaned immediately after buffing to prevent the

TABLE III

SALT SPRAY RESISTANCES OF VARIOUS THICKNESSES OF ELECTRODEPOSITS

(Army and Navy Specification AN-QQ-S-91, Salt Spray Testing Procedure)

Most of the data are from the American Society for Testing Materials Tentative Specification A-166-41T

Electrodeposit of the Following Metals on Steel	Types of Exposure		
	Severe	General	Mild
(1) Brass thickness, in.	0.0006	0.0004 to 0.0005	0.0002
20 pct salt spray resistance, hr	290	140	80
(2) Cadmium thickness, in.	0.0005 (N.S.)	0.0003 (O.S.)	0.00015 (T.S.)
20 pct salt spray resistance, hr	250	200	75
(3) Chromium thickness, in.	0.000025 (AAA)	....	....
20 pct salt spray resistance, hr	16	....	....
(4) Chromium and nickel total thickness, in.	0.000325	0.000125	....
Thickness of nickel plate, in.	0.0003	0.0001	....
20 pct salt spray resistance, hr	48	16	....
(5) Copper and nickel total thickness, in.	0.00125 (F.S.)	ASTM spec. A-5168-39T 0.00075 (L.S.)	0.0004 (Q.S.)
Nickel thickness, in.	0.0006	0.0004	0.0002
Chromium (min) thickness (if wanted), in.	0.00001	0.00001	0.00001
20 pct salt spray resistance, hr	72	48	16
(6) Lead thickness, in.	0.004	0.002	0.0002
20 pct salt spray resistance, hr	250	150	30
(7) Nickel thickness**, in.	0.001	....	....
20 pct salt spray resistance, hr	100	....	....
(8) Tin thickness***, in.	0.0003 to 0.0005	0.0002	0.0002
20 pct salt spray resistance, hr	250	150	30
(9) *Zinc ASTM designation A-164-40T, in.	0.001 (G.S.)	0.0005 (L.S.)	0.00015 (R.S.)
20 pct salt spray resistance, hr	220	140	80
Max number of spots per sq ft no larger than 1/16 in.	6	6	6
Electrodeposits on zinc die castings	ASTM designation	B-142-41T	....
(10) Copper and nickel thickness, in.	0.00125 (F.S.)	0.00075 (K.Z.)	0.0005 (Q.Z.)
Copper (min), in.	0.0004	0.0003	0.0002
Final nickel (min), in.	0.0005	0.0003	0.0003
Chromium if required, in.	0.00001	0.0001	0.00001
20 pct salt spray resistance, hr	48	32	16
(11) Chromium thickness on zinc, in.	0.000025	....	....
20 pct salt spray resistance, hr	48	....	....
Electrodeposits on brass			
(12) Nickel on brass, in.	0.0006	0.0004	0.0002
20 pct salt spray resistance, hr	48	20	7

* Salt spray tests on zinc are not worthy of too much emphasis as to evaluating the corrosion protection under normal atmospheric conditions.

** Black (Moly Black) nickel 0.00003 in. (3½ min deposit) 20 hr salt spray resistance. Anodized aluminum dependent on alloy and time of treatment has 250 hr to over 1000 hr, 20 pct salt spray resistance. Some proprietary white-alloy deposits have about 200 hr salt spray resistance. Excellent lacquered work resists 100 hr or more in 20 pct salt spray and a good lacquer job is one which resists over 50 hr.

*** Electrodeposited tin is generally 0.00003 in. thick and equals 0.5 lb to a base box; hot-dip tinning prior to the war was 2 lb. to base box, equal to a thickness of 0.00012 in. Terne plate, formerly 15 pct to 25 pct tin, now is 10 pct to 15 pct.

TABLE IV

ELECTROLYTIC (GALVANIC) CORROSION FACTORS

(Negative potentials, in volts, as measured by a calomel half-cell using a normal sodium chloride, plus 0.3 pct hydrogen peroxide solution and 0.1 N calomel electrode.)

Magnesium (Mg)	1.73	Al alloys 214 and 56 S	0.87	Al alloy 355-T4	0.78	lead	0.55	Copper	0.20
Mg AM-3S-alloy	1.71	Pure Al and 52 SO alloy	0.85	Al alloy A-17 ST	0.73	tin	0.44	18-8 stainless steel	0.15
Mg AM-57S-alloy	1.68	Al alloys 2-SO 3-SH 3-SO 53-SW	0.83	Al alloy 195-t4	0.70	*chromium (plate)	0.35	Monel	0.10
Mg AM 240 T4	1.66	Al alloys 61 ST 43	0.83	Al alloys 17 ST 24 ST	0.68	18-1 stainless steel	0.29	silver	0.08
Zinc	1.00	cadmium (plate)	0.82	mild steel	0.67	60-40 brass	0.28	nickel (plate)	0.07
Aluminum (Al) 220-T4 and 72 SO Alloys	0.96	Al alloy 365 T4	0.81	iron	0.63	—	—	Inconel	0.04

* Certain proprietary white-alloy deposits have a potential between chrome plate and brass.

In exposed contact under atmospheric conditions, a metal will be electrolytically protective (anodic) to any metal shown in the columns to its right. A metal will be protective to any metal with a lower negative value and the degree of protection will increase in proportion to the differences in their potential values.

Zinc and cadmium are the only commercial metallic deposits which are anodically protective to steel. To a lesser degree, zinc or cadmium will be protective to aluminum. All other metallic deposits will be protective to steel or aluminum only physically, the effectiveness of the physical protection is dependent on the degree of porosity, i.e., the extent in which moisture is excluded from entrance to the basis metal.

possible formation of insoluble metallic soaps, which may occur if the buffed metal is permitted to be held over. In instances where immediate plating cannot be arranged, there are available compounds which will permit the buffed metal to be cleaned, then rust inhibited with a water-soluble film which will enable the work to be held over prior to plating.

Preparation of Specific Metals

Aluminum and its alloys are degreased in solvent degreasers when excessive oil is present, otherwise a well-compounded alkaline cleaner will remove dirt very effectively, though care must be taken not to use temperatures or concentrations that are too high or the metal will be badly etched.

Aluminum alkaline cleaners tend to remove oxides, though there are acid type deoxidizing solutions on the market which are more effective for the removal of the oxides, particularly for preparing the metal for spot welding.

Following an alkaline type of cleaner the metal may be immersed in one of the proprietary acid deoxidizers or in a 30 pct to 50 pct nitric acid solution.

Brass is more effectively cleaned especially following buffing, by cathodic (electrolytic) cleaning, though there are a few well-compounded soak cleaners that meet many requirements for copper alloys. Forced spray or other impingement cleaning procedures are much more effective when using soak cleaners than the use of still baths. Vapor-phase degreasing is also effective in removing some types of buffing compounds.

The cleaning of steel presents many diverse conditions and it must be borne in mind that following the

TABLE V

ATMOSPHERIC EXPOSURE TESTS ON ELECTROPLATED STEEL

(Results of 18 months exposure tests conducted by American Society for Testing Materials, American Electroplating Society and National Bureau of Standards.)

Exposure Site: (1) Non Industrial (2) Industrial (3) Marine	Nickel, Thickness, In.			Cadmium, Thickness, In.			Nickel-Chrome-Copper, Thickness, In.	
	0.000025	0.0005	0.001	0.0002	0.0005	0.001	Total Nickel and Chrome = 0.001 (Cr = 0.00002)	Copper = 0.0003 Nickel = 0.0005 Chromium = 0.00002
Washington	35	82	86	97	100	98	94	95
State College, Pa.	31	70	87	100	100	100	98	97
Pittsburgh	8	20	36	44	82	86	23	20
New York	17	30	67	37	64	77	72	68
Key West	10	25	67	85	85	85	58	40
Sandy Hook	10	27	62	86	93	91	51	46

SCORE	100 (perfect)	80 (excellent)	60 (very good)	40 (good)	20 (fair to poor)	0 (poor)
Pct of surface rusted	0	0 to 5	5 to 10	10 to 20	20 to 50	50 to 100

The protective nature of zinc and cadmium contrast with the lack of protection and the definitely accelerating effect chromium and nickel exert on the corrosion of base iron; thus, rust will "bleed" from the pores in chromium and nickel plate.

TABLE VI

COMPARATIVE FRICTIONAL PROPERTIES OF METAL SURFACES

Frictional Factors	Chromium Plate on Chromium Plate	Babbitt on Chromium	Steel on Chromium	Iron on Iron	Nickel on Nickel	Copper on Copper	Babbitt on Babbitt	Steel on Steel	Steel on Babbitt
Coefficient of friction (sliding)	0.12	0.13	0.16	0.17	0.18	0.18	0.19	0.20	0.20
Static friction	....	....	29	....	....	....	100	55	44

It is to be noted that chromium surfaces have approximately one third less friction than other surfaces.

cleaning cycle, care should be taken to prevent subsequent oxidation. If a rinse in hot water follows the alkaline cleaning, a weighable rust appears (shown on the Gulbransen vacuum balance) within 2 min. after drying. Therefore, if the work is to be plated following the cleaning cycle it must be kept wet.

If the work is to be "painted" following the cleaning cycle, it should be rinsed in cold water to keep it from drying too quickly or a protective dip should be given the metal either in a light rust-preventive oil or in the organic type of water-soluble rust-inhibitor referred to previously.

Zinc diecastings present a peculiar

TABLE VII

COMPARISONS OF PICKLING—DEGREASING—CLEANING PROCEDURES

Factors	Tumbling	Sand and Shot Blasting	Flame Cleaning	Safety Solvent Degreasing	Chlorinated Solvent Degreasing	Emulsifiable Solvent Degreasing	Chemical and Electro-Chemical Cleaning	Immersion and Electro-Pickling	Scratch Brushing
Equipment	Horizontal or tilting barrel—20 to 60 rpm	Air blasting, etc., or centrifugal wheels	Oxyacetylene multiflame torches	Tanks and/or conveying and spraying equipment	Special vapor-phase degreasing machines	Same as for safety solvents and heat	← Revolving barrels may be used (drums)	← Tanks, acid lined	Hand brushes or polishing lathes
Medium (solution or materials)	Steel balls, stars, slugs, or chemicals and soaps	Sand or grit or shot	Oxyacetylene multiflame torches	Mineral solvents with flash point over 100° F	Tri-or per chlorethylene or equal	Mineral solvent mixed with suitable detergents, etc., followed by a hot water treatment.	Generally alkaline solutions	Various acids; see pickling table VIII	Hand brush-polishing lathes; see scratch brush table XVII
Size and Shape Limitation	Maximum 10-lb pieces. No interstices	Generally castings all sizes except smallest—not used after machining	No thin sections; only for large work	All shapes and sizes	Volume of small parts	All shapes and sizes	←	←	Small parts, not for production
Usual subsequent operation	Plate after pickling Painting	←	Painting	Painting or pickling or chemical cleaning, polishing, etc.	←	←	Plating Painting	Alkaline cleaning	Painting Polishing
Surface and Metal effects	Stress relief may occur. Removes dirt and scale. Dimensional changes.		Removes dirt and scale	No change to metal or surface. Removes oils, greases, and removes solid-particle dirt if loosely held.			Removes dirt, vegetable, and animal oils	Removes oxides and scale	←
Operating temperatures	Room, Chemical barrel cleaning at elevated temperatures	Room	Extremely high temperature	Room to 250° F	188° F usually	Room, followed by hot water at 200° F	Generally 140° to 200° F	Room to 180° F	Room
Health hazards	Safe	Precautions required	None	Slight	Great care required	Slight to none	Slight to considerable	Considerable	Slight
Fire Safety hazards, etc.	Safe	None	As hazardous as welding	Fairly safe	Very slight	Fairly safe	None	None	None
Type of workmen	Semiskilled	Semiskilled	Semiskilled	Unskilled	Semiskilled	Unskilled	Unskilled	Unskilled	Unskilled
Mechanical cleanliness—i. e. oxide and scale removed	Yes	Yes	Yes	No	No	No	No	Yes if not too heavy	Yes
Physical cleanliness oil and grease and solid particle dirt removal	No	Yes	Yes	Yes	Yes	Yes	Yes, except mineral oils	No	No
Chemical cleanliness all soils and dirt and chemicals—finger prints	Mostly	Mostly	No	No	No	No	Yes	No	Mostly
Subsequent oxidation	Yes*	Yes*	Yes*	No	Yes*	No	Yes*	Yes*	Yes*

* May be given a protective treatment, as discussed in foregoing explanation.

cleaning and drying problem. Either a scouring-action cleaning procedure, or an electrolytic cleaning procedure is often required to obtain the best surface conditions with some of the zinc diecasting alloys. Other peculiarities of zinc are:

(1) Its soapy nature does not present the ideal surface for "paint" adhesion, therefore the metal must be given special treatments, as noted in table XXV.

(2) The degree of corrosion resistance of the coatings on these alloys is also dependent on the metal being rapidly dried before coating treatments as well as after, therefore forced drying, infra-red lamp drying, drying with sawdust, or a dip in the organic water-soluble solution used for rust prevention on steel.

Data on the cleaning and pickling of other metals such as stainless steels, Monel, nickel, silvers, magnesium, etc., is noted in tables on the subject.

Pickling

Specifics on metal pickling solutions and procedures are presented in table VIII.

Practically all acid pickling baths should employ acid inhibitors, particularly in the pickling baths for steel. The U. S. Navy Specification 51-1-2 require acid inhibitors to be free-rinsing, non-foaming and non-toxic. The standard acid inhibitor is Diortholythiouria.

In acid pickling the control of the acid concentration and/or other constituents is required and the control of the operating temperature is very important, for in general, every 17° F rise in temperature increases the action by approximately five (5) times. The control of the temperature may require cooling and heating coils and thermostatic control.

Electrolytic pickling of steel is more effective than immersion pickling, though for many applications the latter procedure suffices. Also, as indicated previously, the use of forced-spray pickling presents better results.

TABLE VIII A
TYPICAL ACID PICKLING AND BRIGHT DIP TREATMENTS

Metal	*Bath	Temperature, °F	Treatment Time, Min	Application
Aluminum	Nitric acid solution (10 pct to 50 pct)	Room	1 to 3	Removing smut after alkali dips
Aluminum	3 to 8 parts nitric acid and 1 part hydrofluoric acid	Room	½ to 3	Removing smut after alkali dips and brightening diecastings
Aluminum	Various proprietary acid compounds—water	At room, or elevated	1 to 3	Still baths and agitated baths for pickling and deoxidizing
High brass	9 pct sulphuric acid an 1 5 pct citric acid	140	2	Brightener
High brass	54 oz sulphuric, 9 oz nitric, ¼ oz hydrochloric acids with 60 oz of water	Room	1 to 10	Brightener
High brass	5 pct sulphuric acid, followed by a dip in 10 pct to 15 pct chromic acid	140 to 150	3 to 5	Brightener
Low brass	9 pct sulphuric acid, 1 pct cream of tartar and 1 gal of water	125	2	Brightener
Low brass	1 gal sulphuric acid, 2 gal water and 8 lb Bryt Dip (proprietary)	Room	1 to 6	Brightener
Chromium	18 pct hydrochloric acid	Room	1 to 3	Brightener
Copper and alloys	1 gal sulphuric acid and 4 gal water	150 to 180	1 to 60	Removal of scale
Copper and alloys	2 gal sulphuric, 1 gal nitric acid, 2 lb zinc sulphate, 1 gal water	100	1 to 5	Excess of sulphuric "coarsens" Excess of nitric "smoothens"
Copper and alloys	2 gal sulphuric, 1 gal nitric acid, and 5 gal of water	Room	1 to 10	Removal of scale
Iron	6 pct to 8 pct sulphuric and ½ pct hydrofluoric acid and 1 gal of water	160 to 180	5 to 15	Removal of sand and "fire-off" scale
Iron	1.5 pct to 3 pct hydrofluoric acid, 12 pct ferric sulphate–1 gal of water	160 to 180	5 to 15	Removal of sand and "fire-off" scale
Iron	20 pct hydrochloric and 20 pct hydrofluoric and 5 to 15 pct sulphuric acid and water	120 to 180	5 to 20	Removal of sand and "fire-off" scale
Magnesium	15 pct to 30 pct chromic acid by weight 1 pct sodium trifluoride (Avers patent)	120 and higher	1 to 10	Oxide removal
Magnesium	10 pct to 15 pct chromic acid by weight ½ pct sulphuric acid	150	5 to 10	Oxide removal
Nickel-silvers	9 pct ferric sulphate, 5 pct adepic acid	160	1	Brightener
Nickel-silvers	2 gal sulphuric, 1 gal nitric, ½ gal hydrochloric acids and 1 gal water	Room	1 to 2	Brightener
Nickel-silvers	2 parts sulphuric, 1 part nitric acids and small quantity of water	Room	1 to 5	Brightener
Monel	1 gal water, ¾ pint sulphuric acid, ½ lb sodium nitrate, pinch of sodium chloride	180 to 190	30 to 90	Brightener
Monel	½ lb cupric chloride, 1 gal hydrochloric acid (30° Be), 2 gal water	180	20 to 40	Brightener
Monel	1 gal sulphuric acid, 1 lb sodium dichromate and 10 gal water	100	5 to 10	Follow pickle with brightener—dip in 12 pct nitric acid
Steel	50 pct sulphuric or 10 pct hydrochloric acid and water	70 to 90	10 to 20	Pickling 16 gage and under
Steel	5 pct to 15 pct sulphuric or 7 pct to 20 pct hydrochloric acid	120 to 180	5 to 20	Pickling over 16 gage steel
Steel	2 pct to 4, pct sulphuric acid, 2 pct to 4 pct ferric sulphate (ferrisul solution)	160 to 180	10 to 20	Pickling light gages
18-8 stainless steel	6 to 8 parts sulphuric and 2 to 4 parts hydrochloric acids solution with water	140 to 160	2 to 5	Loosens scale
18-8 stainless steel	10 to 24 parts sulphuric, 1 to 4 parts hydrochloric with water	130 to 150	2 to 5	Removes scale
18-8 stainless steel	6 pct to 12 pct ferric sulphate (ferrisul) 3 pct to 6 pct hydrofluoric acid and water	160 to 180	2 to 5	Removes fire scale
Chrome stainless	10 parts sulphuric acid, 1 lb sodium chloride and water	140 to 160	2 to 5	Loosens scale
Chrome stainless	25 parts hydrochloric and 1 lb nitric acids, 100 parts water	140 to 160	2 to 5	Removes scale
Zinc and cadmium	6 pct to 12 pct ferric sulphate, ½ pct nitric, 8 pct to 10 pct sulphuric acids and acid tartarate	160 to 180	5 to 15	Brightener
Zinc and cadmium	10 pct nitric, 2 pct sulphuric acids and hydrogen peroxide	Room	1 to 10	Brightener—do not use prior to plating
Zinc and cadmium	¼ pct to ½ pct nitric acid, or 13 oz chromic acid with 0.1 oz hydrogen peroxide	Room	1 to 5	Brightener

TABLE VIII B
ELECTROLYTIC PICKLING

Metal	*Electrolyte	Current Density, Amp Per Sq Ft	Minutes	Operation
Brass	Electrolyte same as chrome plating bath	4 to 8	1 to 3	Cathodic, room to 125° F
Brass	10 pct to 20 pct nickel sulphate	60 to 80	.....	Cathodic, 100° to 150° F
Nickel and alloys	Sulphuric and phosphoric acids and water, varying concentrations	Varying	5 to 15	Anodic at varying temperatures (brightener)
Nickel-silvers	10 pct to 20 pct sulphuric acid	Varying	1 to 10	Reverse current, varying temperatures and follow with dip in sodium cyanide solution
Nonferrous alloys	Ammonium citrate or 5 pct sodium cyanide	5 to 10	30 sec	Anodic, room to 125° F prior to regular pickling for scouring
Ferrous alloys	75 pct to 80 pct sulphuric acid	1 to 10	1	Anodic, room temperature (brightener)
Steel	Bullard-Dunn processes: 10 oz sulphuric acid, 0.13 oz tin sulphate, 1 gal water	30 to 80	1 to 10	Cathodic
Steel and iron	Ferrous sulphate (0.4N $FeSo_4$) and 0.3 pct sulphuric acid	8	30	Anodic (brightener)
Steel and iron	Sulphuric acid 47.5 g per liter, 10.3 g per liter hydrochloric acid, sodium chloride 22.5 g per liter, little lead sulphate, and liter H_2O	75	3 to 5	Cathodic (Duriron anode) 150° to 180° F
High-speed steels	115 g per liter caustic, 15 g per liter citric acid then dip in 6 to 12 normal hydrochloric few seconds	25	1 to 5	Anodic, room temperature (brightener)

The purpose of pickling is to remove scale and oxides and for most applications it is not only very effective but it presents an inexpensive approach as compared to tumbling or sand blasting.

A comparatively new type of pickler (Kolene) is now on the market for deoxidizing and descaling. It is particularly effective on cast iron as it removes silica. It is a molten-salt bath and operates at about 500° F electrolytically.

Tumbling, Sand Blasting

Castings are often descaled and deburred by means of tumbling in a revolving drum. (See table XIII.) Sand blasting is particularly suitable on rough sand castings.

A metal cleaner must contain:

(1) An alkali or a combination of alkalis.

(2) A material that lowers the surface tension.

(3) A water softening agent.

(4) A substance to cause flocculation (dirt suspension).

(5) The combination of substances must be easily rinsed.

The Alkali Content forms soap (saponifies) with free fatty acids, the soap in turn lowers the surface tension, i.e., increases the wetting ability of the cleaner. The factors of the alkali which control its ability to clean effectively are, the percentage of free Na_2O and the pH; the higher these values the greater the dirt removing power.

The relative Na_2O percentages of cleaners represent the comparative scouring ability, much like the relative stiffness of the bristles in scrub brushes. The pH values represents the force and it is analogous to the muscle or power put behind a scrub brush. In electro-cleaners greater conductivity is obtained in solutions with a higher percentage of free Na_2O.

However, in cleaning zinc, tin, aluminum, and electrocleaners for the brasses, alkali cleaners with a lower pH and a less percentage of free Na_2O must be used to avoid excessive attack on these metals. Table X shows the relative values of the alkali factors.

Wetting Power and Rinsibility—Several proprietary wetting agents present great wetting power and ease of rinsing. Polymerized phosphates, tetrasodium pyrophosphate and sodium silicate, in the order named, also lower the surface tension; caustic soda and sodium carbonate are ineffective in wetting ability. While soap is a good wetting agent it may react with the calcium and magnesium salts in ordinary water to form precipitates which are difficult to rinse.

Mineral oils may be removed by alkali solutions containing wetting agents and detergents; however, the solutions are usually operated hot and the heat tends to remove some of the mineral oil before it is emulsified.

The un-emulsified oil floats to the top of the bath and may recontaminate the metal upon its withdrawal.

Water Breaks generally result from films of mineral oil or soap of fatty acids, which are more apt to be indicated following an acid dip. More thorough rinsing is a remedy or alternate hot and cold rinses for the elimination of water breaks.

Alloys of copper and zinc are particularly susceptible to water breaks when cathodic cleaning is used, therefore a momentary anodic operation should follow to remove the film.

Flocculation and Saponification is the ability to suspend dirt and disperse oils in a solution. Sodium metasilicate is a good flocculator and has a scouring action as well as serving to stabilize the saponified (emulsion) oils and greases. The pH and the reduction of surface tension are the factors in saponification or emulsification.

It is essential to start with balanced formulations and equally necessary to maintain reactions, as some ingredients are expended more quickly than others; hence proprietary compounds offer more certainty than shop preparations.

Table I: Spot Test Identification of Metal Surfaces.
Table II: Accelerated Thickness and Porosity Tests of Plated Surfaces.
Table III: Salt Spray Resistances

TABLE IX

CUTTING AND DRAWING OILS AND THEIR SOLVENT REMOVAL

(Recommended Types of Cutting Fluids: Independent Research Committee on Cutting Oils and Prof. O. W. Boston, University of Michigan).

Machining Operation	For Most Ferrous Metals	Nonferrous Metals (Except Magnesium Alloys—Use Light Mineral Oil, Similar to Kerosene)
Broaching	(S) Sulfurized oils	(ML) Mineral—lard oil mixture
Tapping	S	ML
Threading	S	ML
Reaming	S	ML
Gear shaving and cutting	S	ML
Multiple-spindle automatic screw	S	ML
High-speed, light-feed automatic screw	S	M
Boring—multiple head	S	E
Thread grinding	S	....
Saw grinding	(E) Soluble	E (E or S for aluminum)
Turning—single point and forming tools	E	E (E or S for aluminum)
Planning—shaping	E	E
Drilling	E	E
Deep drilling	S*	E
Milling, plain	E**	E
Milling (multiple cutter)	S	ML

* Soluble oils used for AISI steels Nos. 1110, 1115, 1117, 1118, 1120, 1132, 1137, 1022, 1016, 1116 1111, 1112, 4023, 4027, 4119 and malleable iron, 0.35 pct carbon content cast iron, stainless iron.

** Sulfurized oils for AISI steels Nos. 2S 1S 3360, S2 100, 18-8 austenitic stainless steel, manganese steel, oil-hardened steel, tool steel (low-tungsten, chromium, or carbon). High-speed steels, high-carbon, high-chromium tool steels.

Remove mineral oils of the sulfurized, chlorinated or mineral-lard oil types with either hydrocarbon solvents or emulsifiable hydrocarbon solvents or with chlorinated hydrocarbon solvents. Do not use anodic alkaline cleaning of any metal when chlorinated cutting oils are used. Soluble cutting oils may be removed with mineral oil—do not remove with emulsifiable mineral solvent cleaners. Drawing compounds are mainly soluble oils.

Mineral solvents when loaded with greases and oils may be distilled with an approximate loss of 10 pct solvent. Lacquer solvents may also be recovered in the same manner. For those who do not have sufficient volume of solvents to warrant operating a still, a number of contract plants are located in industrial areas, and the use of such service may result in economy. These solvent recovery plants are as follows:

American Chemical Service, 95 Industrial Road, Hammond, Ind.; George T. Booth, 76 Robinson St., North Tonawanda, N. Y.; Brace Engineering Co., 547 S. Belmont St., Indianapolis; Condor Solvents, 50 E. 41st St., New York City; Dibble Color Co., 1497 E. Grand Boulevard, Detroit (lacquer thinners only); Dorward & Son Co., 260 California St., San Francisco; Eastern Oil Refining Co., Wallingford, Conn.; Franco-American Chem. Works, Carlstadt, N. J.; Leon Finch, Ltd., 728 E. 59th St., Los Angeles; Hammond Chemical Service, 241 Brunswick St., Hammond, Ind.; Industrial Reclaimers Co., 2827 Fort St., Detroit; Leslie Laboratories, Ann Arbor, Mich.; National Solvent & Aluminum Co., 10 West College St., Los Angeles; Nord & Co., 868 Broad St., Newark, N. J.; Oil & Solvent Process Co., 3540 Emery St., Los Angeles; Roblyn Oil Co., 70-88 Freeport St., Boston; Allen E. Rogers Corp., Cooper Ave. and Dry Harbor Blvd., Glendale, L. I., New York; Solvents Recovery Service, 446 N. Eucalyptus Ave., Los Angeles; Solvents Recovery Service, Glendale, N. Y.; Solvents Recovery Service, 1019 Broad St., Newark, N. J.; U. S. Chemical Co., 15444 E. Nine Mile Road, East Detroit; Universal Solvents Co., Live Stock Exchange Bldg., Kansas City.

TABLE X
FACTORS IN ALKALI METAL CLEANING

Alkali	Active Na_2O	Total Na_2O	pH Value 1 pct Solution at 20° C	pH Value 10 pct Solution at 20° C	Amp Per Sq Ft, Comparative Electrical Conductivity at 6v-4 oz per gal of salts		Concentration 0.32 Oz Per Gal, Grams, Weight, Loss Per Hr	
					20° C	100° C	Tin 180° F	Aluminum 212° F
Caustic soda	75.5	76.0	13.5	14.7	28.30	64.90	....	{ 13.5 pH { 129.00
50 pct caustic and 50 pct metasilicate (granular)	51.5	52.6	....	....	16.20	41.10	....	....
Sodium sesquisilicate	36.5	37.9	12.7	13.5	10.10	27.30	....	....
Sodium metasilicate	28.0	29.2	12.5	13.3	6.58	20.40	{ 12.0 pH { 0.14	{ 12.6 pH { 0.22
Silicate of soda	18.7	19.7	12.0	13.4	3.3	11.40	....	....
Trisodium phosphate	10.0	18.0	12.0	12.9	3.76	15.65	{ 11.6 pH { 0.92	{ 12.0 pH { 21.9
Sodium carbonate	29.0	58.0	11.4	11.6	7.05	23.20	{ 11.2 pH { 0.79	{ 11.4 pH { 31.60
Tetrasodium pyrophosphate	8.1	23.3	10.1	10.3	3.86	12.50	....	....
Borax	8.4	16.3	9.2	9.3	2.12	7.55	....	....
(Modified soda) carbonate of soda; sodium acid carbonate	....	....	9.9	9.5	....	.....	{ 10.0 pH { 0.47	....

* The addition of one of the various proprietary organic inhibitors and in some cases wetting agents (as well as agitation) restricts (1) hydrogen embrittlement, (2) excessive attack on metal, and (3) saves acids, and (4) prevents fumes to a great extent. Hydrochloric acid pickles do not cause hydrogen embrittlement to the extent that sulphuric acid pickles.

Newer developments in pickling are the treatment of steel in chlorine vapors for the removal of light scale, and the treatment of cast iron for the removal of silica and scale in a molten bath of Kolene, a proprietary compound at temperature and at a current density of 8 to 25 amp per sq ft cathodically.

Oxidation occurs on metals following pickling and alkaline cleaning rinses upon drying, especially when hot water rinses are used. Proprietary water-soluble compounds may be used in the rinses, which will inhibit oxidation. The inhibited surface may be painted upon, or may be removed by a water rinse when the metal is to be plated.

TABLE XI
TYPICAL IMMERSION CLEANING SOLUTIONS

Metal	Chemicals Per Gal Water	Temperature °F	Time, In Min	Operation
Aluminum	*5 pct to 10 pct caustic soda or 10 pct to 20 pct caustic soda—10 pct NaCl added to obtain silvery etch	120 to 150 Room	1 to 3 1 to 3	Steel tank. Very coarse etch, very irritating fumes
Aluminum	Mixtures of milder alkalines with inhibitors generally well compounded in proprietary brands	150 to 200	3 to 10	Steel tank. Fine etch, comparatively little attack on metal
Brass and copper	Ferric sulphate, also same as steel cleaners	200	1 to 3	Steel tank
Cadmium	300 g per liter ferric chloride 100 g per liter copper sulphate 1 liter water	150 to 180	1 to 5	Lead-lined tank
Cadmium	200 g per liter chromic acid 50 g per liter 1 liter water	150 to 180	1 to 5	Lead-lined tank
Steel	High concentration caustic soda or 2 oz caustic, 6 oz sodium carbonate, 2 oz T.S.P., 2 oz Na Cl and 2 sodium silicate	150 to 200	2 to 10	Steel tanks
Steel	19 parts sodium metasilicate 1 part alkyl aryl silicate	200	1 to 10	Steel tanks
Steel	4 oz sodium carbonate 1 oz soap or 0.1 oz wetting agent	200 to 212	3 to 10	Steel tanks
Tin	Sodium sulphate and mild alkaline	200 to 212	1 to 10	Steel tanks
Zinc	3.5 oz sodium chromate	75	1 to 5	Follow with chromatizing dip, steel tank
Zinc	10 oz to 22 oz tri sodium phosphate 40 oz sodium carbonate 2 oz caustic soda	150 to 200	1 to 5	Follow with chromatizing dip, steel tank
Zinc	1 lb copper chloride 1 lb ammonium chloride 1 lb copper sulphate	100 to 150	1 to 5	Ceramic or glass-lined tank
Zinc	1 lb hydrochloric acid 6.4 gal water	Room	1 to 5	Follow with chromatizing
Magnesium	20 pct caustic soda or other strong caustic solutions	200	3 to 10	Steel tank—follow by dip in chromic acid solution 15 pct with 0.5 pct sulfuric acid, 5 to 10 min at 200° F See Avena patent table VIII A.

* Chromic acid, phohsphoric acid solution for deoxidizing prior to spot welding aluminum; also certain proprietary acid solutions.

Many effective proprietary compounds are marketed to accomplish immersion cleaning. When difficulties are encountered with standard formulations it is well to investigate the claims of cleaning compound manufacturers.

Dilute acid dips in a 2 pct phosphoric, acetic or sulfuric acid is suggested following alkaline cleaning prior to a final rinse.

of various Thicknesses of Electrodeposits.

Table IV: Electrolytic (Galvanic) Corrosion Factors.

Table V: Atmospheric Exposure Tests on Electroplated Metals.

Table VI: Comparative Frictional Properties of Metal Surfaces. Explanation of Charts VII to XII.

Table VII: Comparisons of Pickling, Degreasing, Cleaning Procedures.

Table VIIIA: Typical Acid Pickling and Bright Dip Treatments.

Table VIIIB: Electrolytic Pickling. Electrolytic Pickling Data.

Table IX: Cutting and Drawing Oils and Their Solvent Removal and Solvent Recovery Contract. Distillers. Explanation of Chart X.

Table X: Factors in Alkali Metal Cleaning.

Table XI: Typical Immersion Cleaning Solutions.

Table XII: Typical Electrolytic Metal Cleaning Operations.

The following tables will appear in the issue of Sept. 13:

Notes on Electropolishing.

Table XIII: Barrel Deburring, Polishing, Buffing.

Table XIV: Polishing Wheel Typical Operation Data.

Table XV: Operation Comparisons of Polishing and Buffing Wheels.

Table XVI: Typical Polishing Wheel Grit Sizes.

Table XVII: Scratch Brush Operations for the Removal of Burrs and Scale. Notes on the Selection of Surface Finishes for Functional and Decorative Purposes.

Table XVIII: Physical Characteristics of Electrodeposited Coats.

Table XIX: Physical Control of Plating Solutions.

Table XX: Typical Solutions for Stripping Electrodeposited Coats.

TABLE XII

TYPICAL ELECTROLYTIC METAL CLEANING OPERATIONS

Metal	Typical Electrolyte (Per Gal of Water)	Volts	Current Density Amp Per Sq Ft	Temperature ° F	Treatment Time, in Min	Operating Data
Brass	Mild alkaline solution	7	2	200	2	Cathodic, steel anode, and tank
Brass o be nickel plated	4 oz sodium carbonate 2 oz tri-sodium phosphate 12 oz sodium phosphate 1 oz caustic soda	6 to 12	high	175 to 200	Few seconds	Cathodic, steel anode, and tank
Lead or tin	4 oz sodium carbonate and little tri-sodium phosphate	4	20 to 50	200 212	1 to 3	Cathodic, steel anode and tank, dip in HCl solution and NaCl
Magnesium	250 g per liter chromic acid 150 g per liter sulphuric acid	6	150 to 500	113	Few seconds	Cathodic, lead anode and tank
Magnesium	25 pct hydrofluoric acid	45	400	Room	10	Cathodic, lead anode and tank
Magnesium	12 oz to 16 oz (5 pct to 15 pct) acetic acid	4	400	Room	1/6 to 1	Cathodic, lead anode and tank
Magnesium	7.5 oz sodium carbonate 14 oz tri-sodium phosphate 28 oz caustic soda 0.2-1.0 oz ammonia bauryl sulphate	4	216	140 195	1 to 2	Cathodic, lead anode and tank
Nickel	2 oz sodium carbonate 5 oz sodium sesquisilicate 0.5 oz caustic soda	6	15	210	1/12 to ½	Cathodic, lead anode and tank, follow by 2 pct sulphuric acid dip
Nickel	2 oz sodium carbonate	6	10	120	1/12 to ½	Cathodic, lead anode and tank, follow by 2 pct sulphuric acid dip
Nickel	Patent No. 2,299,054 Sodium cyanide					Cathodic
Steel	3 oz caustic soda	6	10	145	1 to 4 anodic ¼ cathodic	Agitate work, lead cathode
Steel	4 to 8 oz caustic soda	1	20 to 60	180 200	¼ up	Agitate work, lead cathode
Steel	4 oz sodium carbonate 2 oz tri-sodium phosphate 1 oz caustic soda	6 to 12		170 to 200	½ up	Steel anode, brazed to copper bars
Steel	5 oz sodium sesquisilicate 0.5 oz caustic soda	6 to 12		210	1 to 5	Anodic
Zinc	0.5 oz tri-sodium phosphate 1.2 oz sodium carbonate	6		160 180	½ to 2	Cathodic, follow by dip in 200 g per liter chromic acid at 212° F
Zinc	4 oz sodium cyanide 2 oz caustic soda 1 oz sodium dichromate	2	20 to 40		15 to 35	Use wetting agent reverse current

STEEL: Anodic cleaning preferable except in removing drawing compounds in which chlorinated hydrocarbons exist.
ALUMINUM AND ZINC are never cleaned anodically.
NICKEL PLATE is not cleaned electrolytically prior to chromium plating due to passivity created by electrolytic cleaning.
Many proprietary electrolytic cleaners are offered.
An interesting approach to metal cleaning is a new development called Kolene which makes use of fused salts at a temperature range between 850° to 950° F and utilizes a reverse current procedure of operation at 8 to 25 amp per sq ft. It is claimed that Kolene removes silica and carbon from cast iron effectively. Another new cleaning and pickling development is cathodic cleaning in fused caustic soda.

The following tables will be presented in the issue of Sept. 20:

Table XXI: Key Numbers to Data on the Regulation of Baths for the Quality Control of Deposits. Bath Regulation Data as per Key Numbers. Data on Proprietary Baths.

Table XXII: Surface Treatments of Aluminum Alloys.

Table XXIII: Surface Treatments of Magnesium Alloys.

Table XXIV: Typical Metal Etching Procedures and Embossed Metal Data.

Table XXV: Immersion Treatments for Increased Corrosion Resistance, Paint Adherence and Appearance. Production Painting on Dye Coloring of Metals.

Table XXVI: Government, Army and Navy Specifications on Zinc Chromate Primers.

Table XXVII: Comparisons of Physical Factors of a Few Synthetic Lacquers and Infra-Red Drying Data.

The following tables will appear in the issue of Sept. 27:

Table XXVIII: Comparative Data, Army and Navy Specification Lacquers and Enamels.

Table XXIX: Comparisons of Convection and Radiant (Infra-Red) Drying Time. Explanation of Chart XXIX.

Table XXX: Comparative Drying Time of Colored Lacquers by Infra-Red Lamps.

Table XXXI: Tinting and Hiding Power of White Pigments.

Table XXXII: Luminescent Coatings. Surface Designation of the American Standards Association.

Table XXXIII: Typical Preservatives (Rust Preventives).

Table XXXIV: Devices Relative to Metal Surface Testing.

(To be continued next week.)

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Trepanning Welded Joints

. . . Although a destructive type test and covering small areas, trepanning is a valuable welding inspection tool for revealing certain critical defects not detectable by other methods. In the experience of Calship, the combination of trepanning and X-ray appear to be the ideal inspection procedure. Interpretation of photographs of plugs removed from welds by trepanning can readily be done by welders of average skill.

IN order to be reasonably sure of the soundness and quality of welded joints, visual inspection is not enough. Therefore, some method must be used which will tell of the condition inside the joint.

Several standard methods are available. However, each has its limitations, advantages and disadvantages. The selection of the best method to be used depends on the information required and the use of such information.

At Calship the following information was desired at a minimum cost, in the shortest possible length of time:

(1) Soundness of the weld, i.e., absence of defects such as slag, gas pockets, lack of fusion, cracks, lack of penetration, etc.

(2) Plate edge preparation for welding.

(3) Fitup of the two members prior to welding.

(4) Procedure of welding, i.e., weave or stringer beads, type and size of electrode, etc.

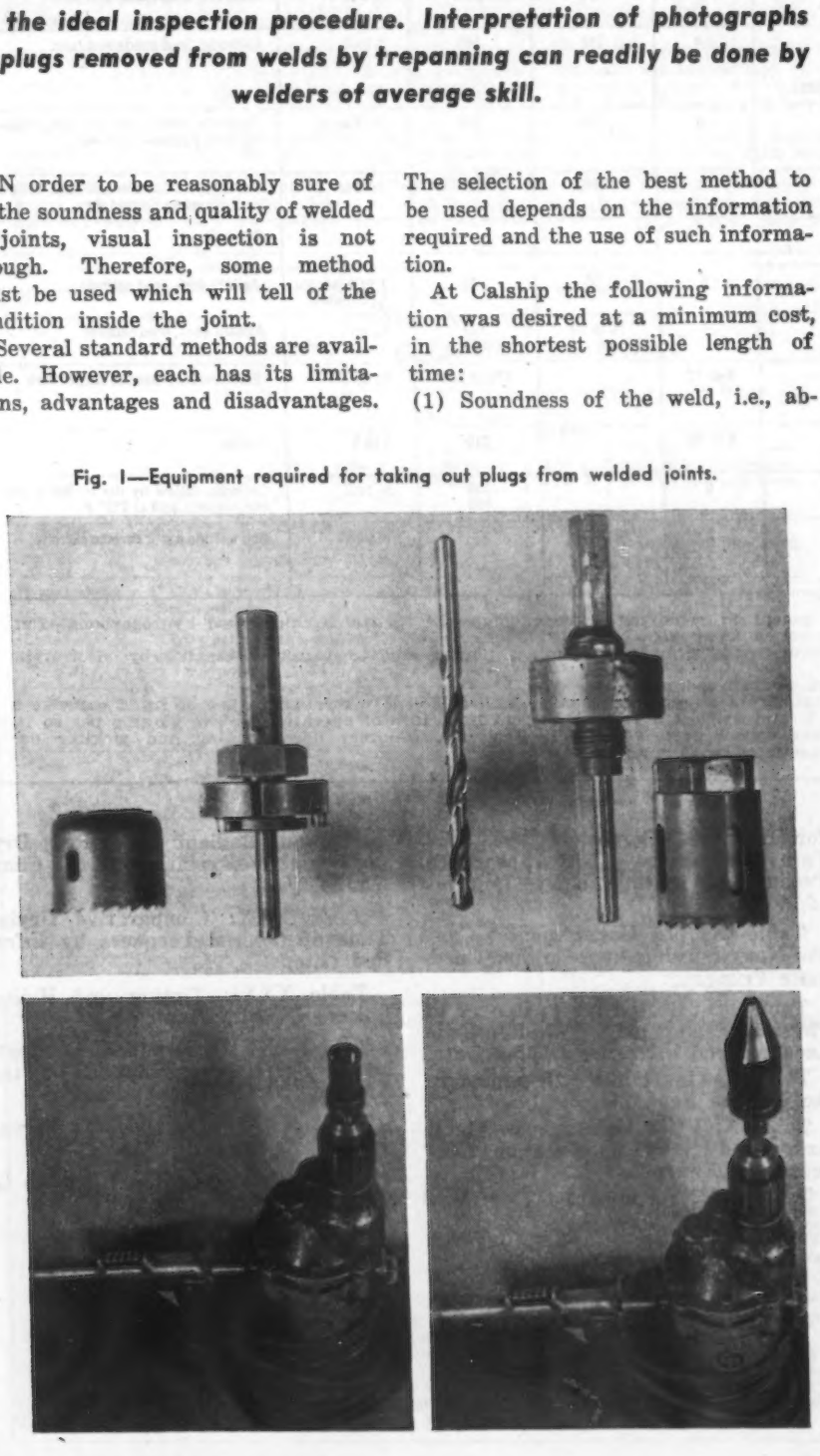
(5) Examination of the plate stock for segregations and liminations.

This information when accumulated should serve as an inspection control of welding and fitting quality in certain joints, and in a broader sense for the analysis of welding practices and procedures. The information could serve as an educational and informational media for the operator as well as for supervision and management. It may serve as a permanent record of the welding of each unit and hull, so that comparison could be made of supervision, welding operators, procedures, and also to locate common difficulties on specific joints. In case of defects, it could be used for the determination and fixing of craft responsibility (fitters, burners, chippers, welding operators, etc.).

In comparing inspection methods appropriate for these ends, some of the advantages and disadvantages of the trepanning procedure come to the fore soon enough. Unlike Xrays, radium or Magnaflux, trepanning is a destructive type test. But it is simple and does not require expensive equipment. Plugs can be removed from the welded joint by unskilled labor. These plugs after etching and photographing can be used to tell the complete story of the one spot. With the minimum of accompanying explanation, the welder can learn from the photographs the fitup, the plate condition, the preparation and procedure of the weld. A distinct disadvantage of trepanning is that it covers a small area compared with Xray, for example, which can be used to cover considerable linear length of joint, ranging from 6 in. to 18 in.

If the ultimate in perfection of

Fig. 1—Equipment required for taking out plugs from welded joints.



for Defects

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weld quality inspection is required, a combination of the several inspection techniques mentioned above will be necessary. However, in analyzing these methods it was felt that trepanning was more suitable for use at Calship due to the following major considerations:

(1) Certain critical types of defects are not detectable except by trepanning.

(2) Plate edge preparations, fitting, etc., cannot be suitably and definitely determined after the joint is completed, except through trepanning.

(3) Steel stock used cannot be checked for defects such as laminations and segregations by the use of any method other than trepanning.

(4) Photographs are easily made of trepanned plugs and serve the purpose ideally, as far as education of various personnel involved is unnecessary. An extremely vivid picture of all conditions involved is available. There is no argument as to interpretation.

(5) Cost is cheaper in trepanning than in making Xray or gamma ray shots. A cost survey was made in the yard and then checked elsewhere in heavy industry such as shipbuilding, pressure vessels, etc., and verifies this lower cost. This lower cost covers cost of repair of holes after removal of plugs.

In order to familiarize others who may be interested in the use of the trepanning method for inspection and control of welding, the following system and procedure as used at Calship, is outlined:

The locations of test plugs on the various joints were selected by a committee of all interested persons and agencies. These locations, are chosen so as to cover the following critical spots of the ship:

(1) Erection butts of sub-assembled sections—shell and decks.

(2) Tank joints.

(3) Welded joints at the critical stress points of the ship, i.e., including sub-assembly welded joints in such locations.

FIG. 2—Sawing out plug. A pry bar is helpful to maintain steady pressure in case of horizontal trepanning.

The test plugs are marked off daily in line with welding completion of the joints in each unit involved. Test plug crews then take the plugs from the locations as marked. Procedure in actual machining out the plugs, preparation for examination, repairs, etc., is now outlined:

Equipment required, (see fig. 1,) consists of the following:

(1) "F" size drills.

(2) ¼-in. electric drill for pilot hole.

(3) ¾-in. heavy-duty electric drill for saw and countersink.

(4) Arbor.

(5) Hole saw, 1¼ in. diam.

(6) 2-in. reamer with 45° taper.

(7) Midget air chipping gun.

(8) Specially tipped chisels.

The following is the sequence of operations for taking out a test plug from weld:

(1) Drill pilot hole using F size drill.

(2) Use special tempered guide in arbor, ¼-in. diam.

(3) Start sawing with a dull saw to prevent breaking teeth, and groove ⅛-in. deep using guide.

(4) Replace worn saw with sharp one. Remove guide and continue through the material.

(5) A pry bar or "old man" may be used to maintain steady pressure in overhead or horizontal trepanning (Fig. 2).

(6) When sawing in a flat position, air can be used to keep cuttings cleaned from around the saw teeth. Cuttings clog saw causing excessive heating and binding. In

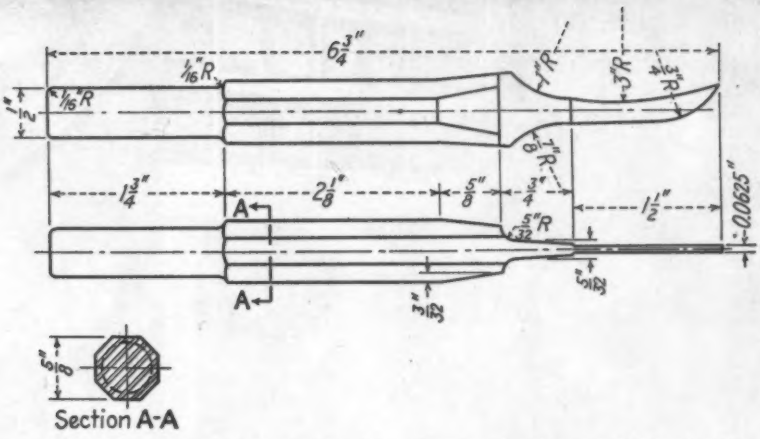

FIG. 3—Special steel chipping chisel for removing broken saw teeth when trepanning weld test plugs.

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case a tooth breaks off and becomes clogged in the groove, a chipping tool as shown in fig. 3 can be used in a midget shipping gun to dislodge the teeth.

(7) In flat trepanning, the plug, after being removed from the plating sometimes falls out of the saw before the operators get it. To overcome this difficulty a tool as shown in fig. 4 was devised to serve as a continuous guide until the operation is complete. The clips fly out under centrifugal action. It can be seen that the plug will fall against the "butterfly" and will not drop out into the compartment below. Another type is the slotted "spring" type also shown. The butterfly type is more satisfactory.

(8) To facilitate repairs, after removal of the plug, the hole is countersunk using a 2 in. reamer with a 45° taper countersinking to within 3/16-in. of bottom of the hole, thus leaving a 3-/6 in. land.

In fig. 5 is shown the plug in various stages of preparation. On the left side the plug is shown as-tagged and as-received from the ship. Second from the left is the plug as faced down in the lathe. Third from the left shows stencil identification on the edge, while the picture on the right shows the plug as polished down and etched. The procedure for examination preparation is as follows:

(1) Face down the plug in a lathe in a direction perpendicular to the line of a weld.

(2) Stencil identification on edge of plug.

(3) Polish plug on a water belt sander.

(4) Etch with iodine solution and then with ammonium persulfate solution.

(5) After taking photograph of both sides at 2½ magnification, cover etch with glyptol for preservation.

Repair of Plug Holes

A record of examination and decision as to the condition of the weld is made on a test plug record card. If the weld must be repaired, then the seam is ripped open with a scarfing torch or by chipping, but preferably by the torch since defects appear and can be washed out much more readily by this method (also being much cheaper, and it is rewelded. If defects are minor or are not present, the hole is then repaired.

Complete reports by hulls are then made up and sent to all interested personnel and agencies. In the meantime, however, pictures are given to production supervision and personnel for education of welding operators and for use in correcting fittings, chipping, burning, etc. These photographs are posted in the offices on the shipways, skids, etc. In other words, to obtain effective use of test plugs it is necessary to follow through at the earliest possible time.

In order to analyze defects and to know the relative seriousness of each one, it is necessary to have a set of standards. Since information concerning standards is scarce on this type of inspection, it was felt necessary to make numerous physical tests on welds containing known types of defects. The number of tests so made is approximately 5000 at the present time, and through the results of these tests a set of standards was established.

RIGHT

FIG. 5—Steps in the preparation of the plugs for examination, showing plug as received from ship, facing down in lathe, stencil identification and, on right, polished and etched plug ready for photographing.

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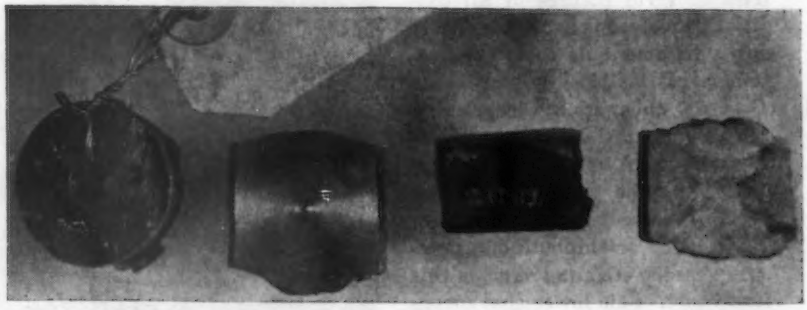
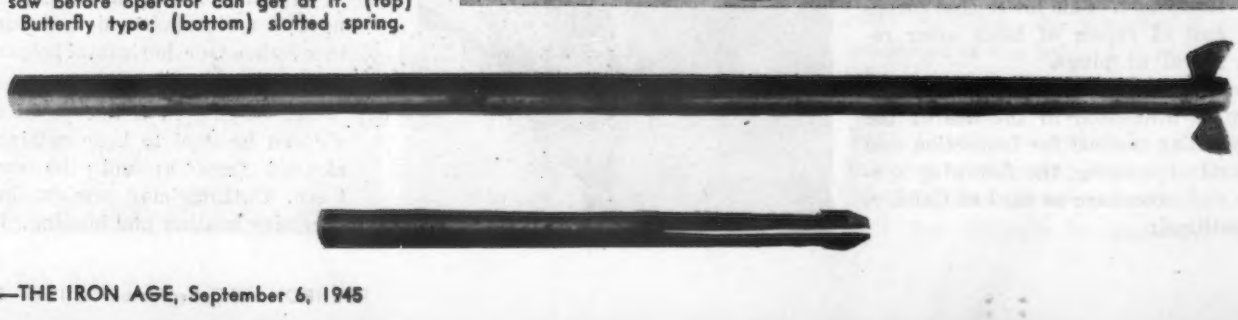
FIG. 4—Special tools used in flat trepanning to prevent plug from falling out of saw before operator can get at it. (top) Butterfly type; (bottom) slotted spring.





Graphite Molds For Short-Run Castings

. . . In view of the better controls being introduced and more complicated shapes being cast centrifugally, the use of graphite molds shows considerable promise. Graphite inserts may eliminate machining operations such as hole boring, and undercuts and irregular contours will eventually be cast rather than machined.

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SINCE its inception, the casting industry has made use of gravitational force in filling molds and replacing shrinkages. In fact, many developments have followed discoveries made from the effect of gravity on casting. In particular, variations in pressure depend on the height of risers and gates. When it was discovered that increased hydrostatic pressure resulted from stepped-up gate heights, other means of raising pressure developed. One method uses centrifugal force to provide pressure in eliminating the use of cores and increasing the proportion of usable casting to total molten metal.

In this process there are two variations. The first, centrifuging, consists of rotating an ordinary mold on a spinning machine, using the gate or pouring basin as an axis. Hydrostatic pressure, caused by rotation, forces the gate-poured metal to outer parts of the mold. Problems in preparing molds for this type of casting are typical foundry problems, mainly those of ordinary sand techniques.

The second variation is true centrifugal casting. In this process, a symmetrical mold is spun on the axis of a cylindrical casting opening. Sleeves and bushings are customarily made by this method. In casting a sleeve, the bore is produced by a measured amount of metal activated by centrifugal force which throws it against outside mold walls. Except in the case of the casting made on a horizontal axis, this opening is not a true cylinder. In all other instances, the bore is part of the parabola created by rotation, and it approaches a true cylinder more closely as speed is increased. For this reason, high speeds are used. The resulting pressure and erosion of mold surfaces determine the type of materials that may be used.

Surprisingly enough, it has been found possible to produce centrifugal castings in regular foundry sand with the use of ordinary binders. One patented process centrifugally packs sand inside a rotating drum-shaped container. The mold surface is formed by a tool with the same profile as the desired casting. A specified amount of metal is then poured into the rotating head. When the metal has solidified, the cycle is complete. The mold is stopped, the casting is removed, and a new cycle is begun.

Obviously, if this method is used an extensive investment in equipment is required, and production must be high to justify cost.

When molds are prepared for normal castings without packing the sand by centrifugal force, ordinary foundry sands may be used. The procedure used in spinning cores of this type is often referred to as the centrifugal method. Where centrifugal casting is used to eliminate a central core, or to gain specific qualities, additional amounts of clay or organic binders are required to give sufficient strength to the sand. In this case, mold costs may be higher than for normal static casting, but elimination of cores and an increased metal yield will compensate for initial expenses.

In general, use of green-sand molds is limited to productional methods where cost of permanent molds is neither justifiable nor practical, and where low speeds which prove practical with this type of mold material do not result in objectionable parabolism of the uncored central hole. Metal yield is greater in all types of centrifugal casting than in casting made by static methods.

Baked or dry-sand molds are used where there is a requirement for greater strengths than can be obtained with green sand. For this reason, they lend themselves readily to moderately large castings and stack moldings. They not only have an obvious advantage in resistance to

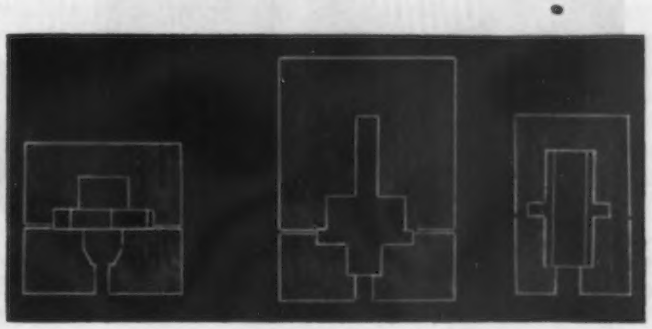

FIG. 1 — Simple cope - and - drag type molds are not limited to the use of a single piece; design possibilities are numerous. The graphite mold has an advantage over metallic molds in lightness in weight, a piece of 6 in. in diam by 1 in. in thickness weighing 1.6 lb.

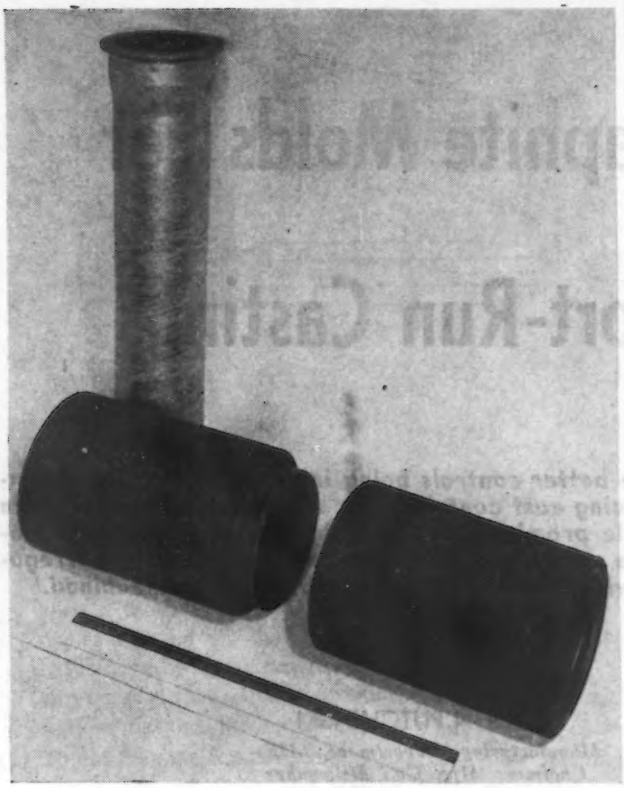

FIG. 2—Two small cast rods machined to make a single long casting. This is an example of the economy gained in the use of graphite rod by placing two pieces of worn molds together to form a single large casting.

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metal erosion, but in the ability to withstand relatively higher speeds that result in improvements in bore dimensions.

Methods used in preparing dry-sand molds for centrifugal castings parallel those used for static casting in the same material. Consequently, molds may be oven-dried or skin-dried. Oven drying involves ordinary foundry procedures. Skin drying, as the term implies, consists merely in drying the surface of molds by use of a torch or a charcoal fire-basket. Another method used is that of spraying a coating material suspended in alcohol or similar solvent on a mold and then burning off the solvent. Mold washes or coatings aid casting appearance due to refractory characteristics. Dry sands are preferred to green sands because of higher tensile strengths and greater sturdiness.

Both molding materials require production of a new mold for each casting and require the use of several flasks or casting heads to retain sand during mold manufacture and in casting. Foundry core sands, on the other hand, permit advance production of many cores, which may be dropped into place in a single retaining ring or flask when needed. Requiring less equipment, this process reduces production costs on a number of identical castings.

Core sands are generally of the same type as those found in ordinary foundry practice with much the same care given to venting and gas removal as in static casting. Due to the action of centrifugal force which will emphasize any core defect, there is a noticeable preference for a fine-grained sand.

All of these methods require a repetition of the molding cycle and do not lend themselves readily to mass production, except in isolated cases. Storage of raw material and necessary equipment are roughly proportional to the number of castings to be made and costs remain proportionately high with production in anything but large quantities.

Where design permits, the answer to the problem of repetitive production is use of permanent or semi-permanent molds. Many types of mold materials have been used, and each type has its own peculiar advantage or disadvantage.

Many materials and combinations of materials are used. Each manufacturer chooses a type of material most suitable to his manufacturing conditions. Cast iron, cast and forged steels, and graphite are the most commonly used. Other materials include bronzes, high clay-bonded sand and ceramics, but they are utilized for special conditions rather than for general applications.

Cast iron has been used with uniform success. Its value lies in high heat conductivity and ready availability. In casting of non-ferrous materials the high heat conductivity and susceptibility to checking make use of an insulating mold wash prac-

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FIG. 3b—This is the same graphite mold and rod as in fig. 3a after it has been machined. It is now ready for use. The results prove satisfactory in economy and production. Small plugs can be inserted into a worn mold to make castings of a small diameter.

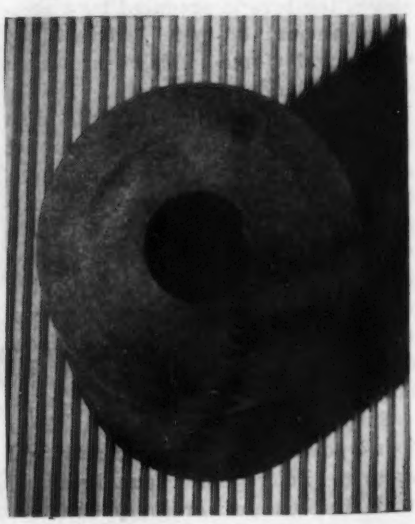
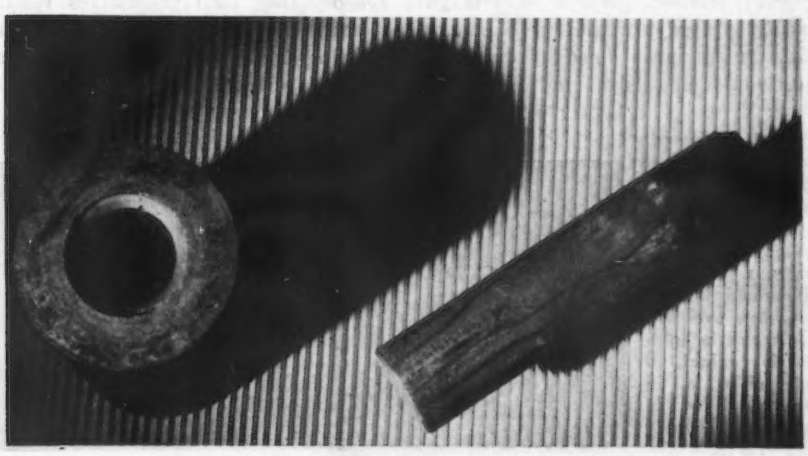


FIG. 3a.—A worn graphite mold and a salvaged graphite stirring rod before machining. A broken graphite stirring rod was forced in and machined to the specific dimensions of a casting rod.



tically a necessity. Without washes, cold shuts or laps may result, or mold surfaces may be impaired.

Molds made of cast iron are heavy and require sturdy equipment, but such equipment is desirable in any case. Fire-checking on the mold surface is perhaps its greatest disadvantage. Some of the most successful cast-iron molds contain varying amounts of nickel, chrome, molybdenum, or combinations of these alloys to overcome surface cracking. When using molds for casting alloys containing phosphorus, such alloys have a tendency to "wet" the mold, preventing easy removal of casting.

Steel molds present some of the advantages and disadvantages that are found in cast iron. Like cast iron, when the mold becomes overly hot, steel molds acquire "shrinks" on the casting due to interference in progressive solidification. Machining cost may be greater but will be justified by increased production. Because of its greater strength and toughness, steel will often show an actual saving in comparison with cast iron.

Nonferrous metal molds are sometimes used in brass foundries, and when utilized with good judgment give good service and life. Care must be taken because of "hot-shortness" found in some compositions. For this reason, it is desirable to keep the mold at low temperatures.

All three classes of metallic molds have a useful place in production foundries and are employed with a fair degree of success. Good mold materials have these characteristics:

(1) Permanent molds must produce large quantities of castings to reduce initial machining and material costs per individual casting. Permanent molds are generally not considered for casting lots of less than 500 pieces.

(2) Machinability must be excellent, save for exceptional applications, to hold mold cost within reasonable limits.

(3) Thermal conductivity of the mold must promote progressive solidification but not so high as to cause apparent cold shuts.

(4) Availability of the mold material must be considered as a cost factor.

(5) Uniformity and lightness in weight are desirable in handling and in reducing machine loads at high speeds.

(6) Material must not readily be "wet" by phosphorus alloys.

The relative importance of these factors varies with the frequency of the casting cycle, and with the quantity of castings.

For production of moderate amounts of castings (numbering tens to hundreds) another material — graphite electrode rod—satisfies most requirements of a good mold. Its resistance to erosion or mechanical wear, however, is lower than iron and steel. As the mold heats up this condition becomes more evident. Consequently, it will prove less desirable in orders of a thousand or more units.

the electrical field where it is used for anodes in rectifiers, brushes in commutators, and in a variety of other applications familiar to this field.

Perhaps, the greatest value of graphite rod in centrifugal casting is its low coefficient of thermal expansion; it is two-thirds of cast iron and less than half that of bronze. As a result, the mold frees itself readily from castings, since it does not contract as rapidly as the castings.

FIG. 4—Operator inserting a graphite mold into the head of a centrifugal casting machine. Graphite is received in standard sizes, requiring little surface machining to fit into heads used on casting machines.

Graphite can be obtained in a variety of forms and shapes. Furnace electrodes in the form of cylindrical rods are more practical for centrifugal casting. Care should be taken to obtain the proper type of graphite. True graphite, which is easily recognized by its lustrous black surface and unctuous feel, is preferred to the amorphous-type carbon electrodes, which have more abrasive properties and lack the heat conductivity of true graphite.

This material is not uncommon to foundries, since it has been used for pouring spouts and in gates where sand readily burned out. It is also used in electric arc furnaces as electrodes. Industrially, graphite rod has found its greatest application in

Graphite is purchased in rod form of standard sizes, requiring little surface machining to fit into heads used on the casting machines. Much of the advantage of graphite molds lies in the ease with which they can be machined or altered. Ordinary tool steels can be used for machining purposes; heavy cuts are made with ease. As a result, molds of simple cylindrical shape can be readily machined in 15 min with ordinary lathe equipment. Even when larger diameters or more complicated shapes are required and more time is needed, there is a distinct advantage in comparison

(CONTINUED ON PAGE 170)

. . SKIN HEATING . .

. . . Improved surface finish is being obtained in aircraft by thermal expansion of the light-alloy skin prior to riveting. The practice suggests possibilities for fabrication of certain peacetime goods.

RIVETING of metal aircraft skin is a matter in which practice frequently falls short of the attainable degree of perfection. Apart from causing increased drag, faults such as buckling, panting or oil-canning are undesirable from a structural point of view. They tend to prevent the skin from developing its full stress-loading and may necessitate the use of heavier-gage material or an increase in the number of stiffening members to overcome the practical difficulties of manipulation encountered in manufacture.

A process has been developed which overcomes many of these difficulties and greatly improves surface finish by the use of electrically-heated blankets to expand the light-alloy plating before it is riveted to the structure. The blankets contain resistance wires enclosed between layers of asbestos fabric, and are placed in close contact with the skin-plating, which is supported in such a manner as to be free to expand. Electrical current passing through the blanket raises the temperature and expands the skin plating. In this heated condition the panels are drilled and riveted along the edges. After the removal of the blanket the skin cools and becomes taut. Riveting is then completed in the normal manner, and the resulting component is free from quilting and the oil-can effects which so often result from standard riveting practice on thin sheets.

The process is used by Vickers Armstrongs, Ltd., England, and the blankets are made by Warmex, Ltd., Cambridge. The blankets are similar to domestic heating blankets[1], and consist of heater elements of resistance wire covered with asbestos or glass yarn sewn between sheets of asbestos fabric, and of such a size that one panel is covered by each blanket. The edges are left free to allow riveting to be carried out. The contact surface is corrugated and each blanket is impregnated with a heat-resisting synthetic resin. A backing consisting of a steel frame and Alclad sheet gives the blanket the strength and rigidity to hold the necessary shape when it is desired to apply heat to a curved panel.

[1] *Described in Aircraft Production, May, 1945.*

Figs. 1 and 2 illustrate a typical blanket. It will be seen that the steel backing-frame carries metal stirrups. Over them passes a stout leather strap into which a coil spring is inserted. The straps furnish a means of suspending the blanket from the jig structure, and the stirrups serve as contact points through which pressure supplied by the coil spring is transmitted to the blanket to keep it in close contact with the skin-plating.

Blankets vary in size and shape according to the area and thickness of the skin-panel to be heated. The dimensions are established by initial calculation based on the rate of expansion of the material and finally determined by trial on the actual component.

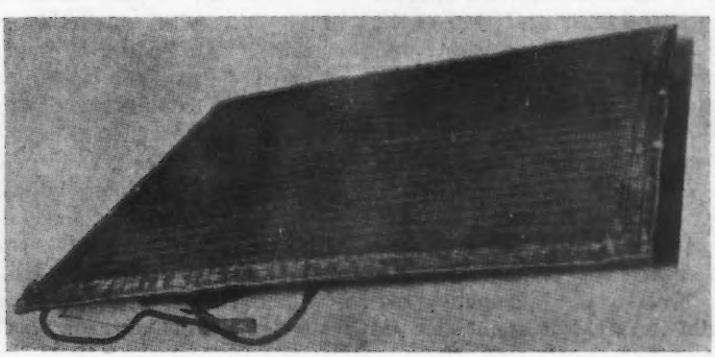
Electric current for heating passes from the mains through a control box to the blankets. This box is a thermostatically-controlled time switch. By setting a pointer on a scale graduated from 0 to 100, the period is varied during which an electrically-heated bi-metal strip makes contact. When contact is made, a relay is actuated, the main current supply switched on, and an indicator light appears. After a period depending on the dial setting, the bi-metal strip distorts sufficiently to break the control circuit of the relay, and the current is switched off. This cycle is repeated indefinitely, and is independent of the temperature of the blankets.

The method of use is to establish the setting which will allow the necessary temperature to be reached in a period of approximately 10 min, and then the setting which will maintain this temperature. These values are established by experiment.

The switch-box is mounted on a shelf on the end column of the assembly fixture and connection from it to the blankets is made through a conduit which extends along the top beam of the fixture. Junction-boxes with three-pin sockets are introduced into the conduit at suitable intervals. A flexible lead is attached to each blanket and terminates in a three-pin plug which is connected to the appropriate point on the conduit.

The skin-panels, which are cut to size and predrilled with undersize holes, are located on the structure, which is also drilled in the usual way. Single screws at the center of each horizontal edge hold the panels in po-

FIG. 1—Front face of the blanket showing the asbestos fabric-covered corrugations which contain the resistance heater elements.



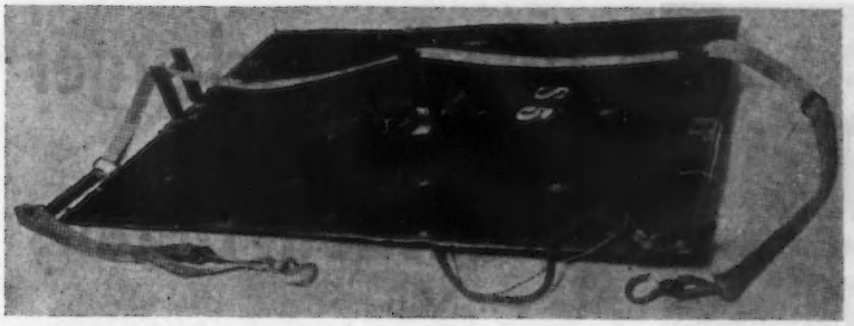


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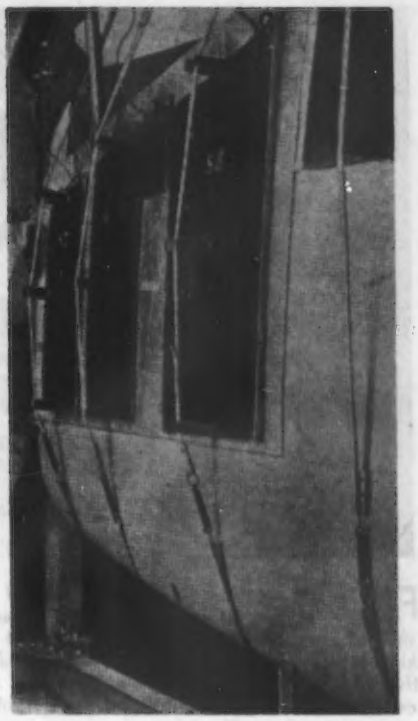
FIG. 2—Rear face of the blanket showing the stirrups, leather strap and spring by which the pressure is applied to the skin-plating.



RIGHT

FIG. 3—Close view of three of the panels in position showing the springs inserted in the retaining straps to supply pressure.

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sition, the vertical edges being left free. The blankets are then suspended from the fixture over the skin and pulled into contact by the spring-loaded strap, which is fastened to attachments on the fixture near the ground (fig. 3).

The whole skin surface of the component is covered in this way, and electrical connection made to each blanket. A thermometer is inserted between the plating and one of the blankets as a check on the temperature. The pointer on the control box is then set to read 70, and the main switch put over. The indicator light appears at once. After a period of about 10 min, the plating will have attained a temperature of 200° F, which should be checked.

The pointer on the control panel is then turned back to read 35, and the indicator light will show intermittently as the current is switched on and off to maintain this temperature.

The holes in the skin-plating are next opened out to the correct size, and the edges of the plates riveted to the structure while the plating is still hot. Current to the blankets is then switched off and they are removed. The final stage in the operation consists of normal countersunk riveting.

Production experience has shown that the total time required to apply the skin-plating to the rear portion of a Spitfire wing is reduced rather than increased by using this process. It has also been established that assembly and the use of blankets can be carried out successfully by unskilled labor.

At present, only wings are treated in this manner, but experience gained indicates that the method may be applied with advantage to all external plating, particularly in thin gages. On the score of cost it seems probable that the adoption of the process would be worth while on small production quantities of the order of 50 aircraft.

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HEAVY bus bumpers are shown being shaped by compression roll forming on a 25-ton Bath universal contour forming machine. It is estimated that if this work were to be done on a press, it would require a 1000-ton machine. Since the roll forming process overcomes the elastic limit of the material only in a small area at a given time, the tonnage required is much less and the cost of dies are correspondingly low. If these bumpers were to be made on a conventional bulldozer it would be necessary to make several separate pieces which would later have to be joined together to make the complete bumper.

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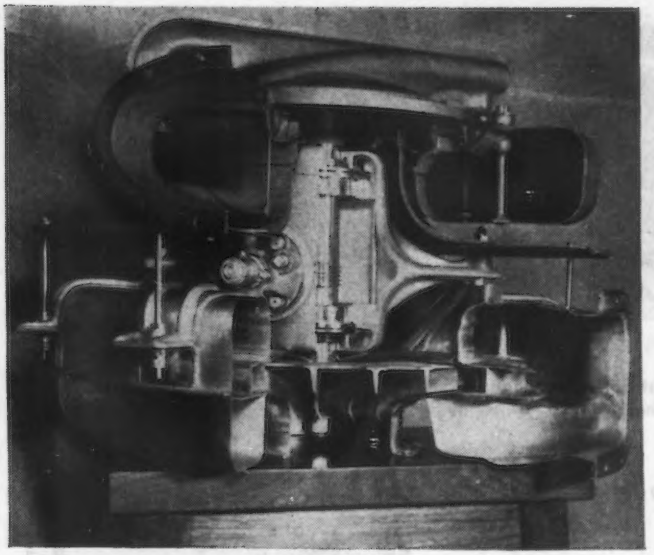

FIG. 1—This cutaway gives a good idea of the complexity of the turbosupercharger. Upper half is the rotor wheel section, fed by the exhaust gases at high temperature. The motion is transmitted through the shaft to the impeller below, the vanes of which can be seen in profile just above the table in the cutaway portion. The whole is encased in a steel compressor casing which brings the air to the engine.

Turbosupercharger Production Details

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By S. H. BRAMS
Detroit Editor, THE IRON AGE

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. . . A number of very interesting welding, precision casting, and design innovations were devised to master the very difficult job of quantity production of precision turbosuperchargers, which in turn has greatly aided in the manufacture of gas turbines for jet aircraft.

THE manufacture of turbosuperchargers for high-output aircraft engines is considered by Ford Motor Co. engineers at River Rouge as perhaps the most difficult job which ever came to the works.

The turbosupercharger built by Ford was developed by Dr. Sanford A. Moss, of General Electric Co. As is generally known, it is a device for improving the efficiency of aircraft engines in high altitudes. The concept for doing this is comparatively simple, but its execution is profoundly complex. A rotor wheel is located in the aircraft so that it intersects the air stream of the exhaust, whirling under that impact at peripheral speeds much in excess of the flight of a bullet. Its shaft is connected with a blower fan which receives air from the outside and compresses it in rarified atmosphere to the point that the cylinder charge of oxygen approaches that of sea level.

Obviously all parts of the turbosupercharger, fig. 1, must be precisely balanced and precisely dimensioned to provide best efficiency. Whirling in excess of 30,000 rpm imposes almost unbelievable tension stresses on all moving parts. Further, the rotor wheel buckets in the exhaust gases function at temperatures of 1500°F or thereabouts, while only a few inches away on the short shaft the blower operates in atmosphere which may drop to a temperature of —67° F. It is evident that the turbosupercharger job calls for most intense engineering study.

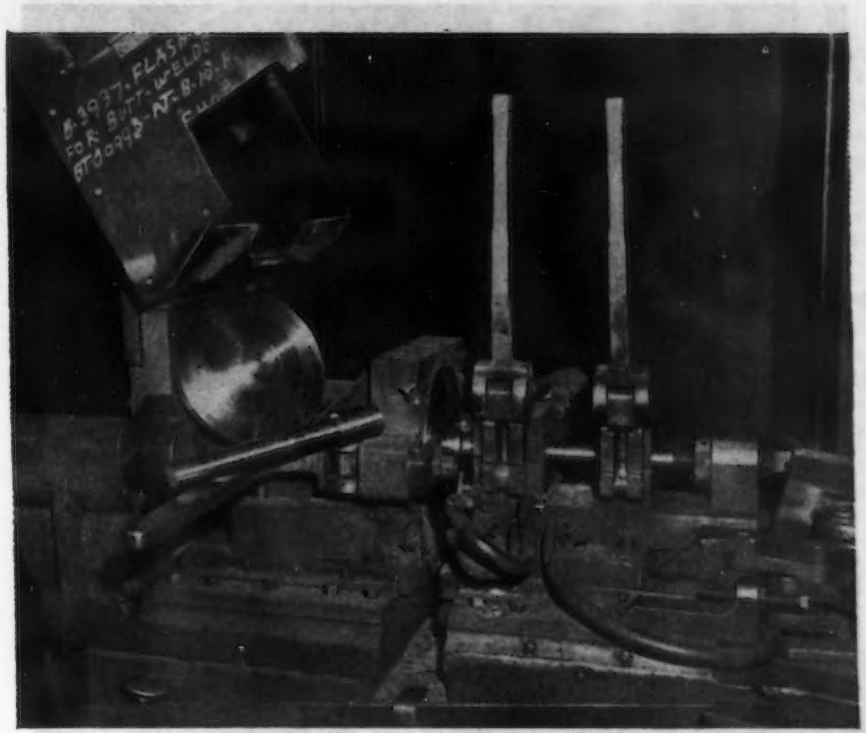
After lengthy examination, the Ford engineers came up with a number of major changes from the original designs. The original prints called for joining of the buckets to the rotor wheel by a dovetail press fit, and the joining of the wheel to its shaft with three bolts. Ford proposed welding in place of each of these operations. The original nozzle diaphragm whose function it is to direct the hot exhaust gases to the buckets was originally a welded structure. Ford proposed that it be cast, despite its complexity and the necessity for maintaining very close dimensions. The compressor casing, a most involved structure, was originally cast in aluminum alloy; Ford proposed that it be stamped out of low-carbon sheet steel, in sections for welding.

Before Ford could prove that its recommendations not only improved the product, but also quickened production, reduced weight, and lowered cost, there were many laborious engineering problems to be solved—techniques of casting, techniques of welding, techniques of processing. They all finally evolved into a smooth and extremely worthwhile production system, the details of which should be of wide interest, though this contract at Ford has now been completed, because similar procedure is followed elsewhere.

The supercharger job at Ford naturally divides into four broad operations, all ultimately combined in final assembly. These four are: flash welding of the shaft to the rotor wheel, comparatively minor alongside the others; the arc welding of the buckets to the wheel; the casting and machining of the nozzle diaphragm; and the welding of the compressor casing. The flash welding of the shaft to the wheel will be treated first.

This shaft is 12 in. long, its diameter being 1¼ in. It is produced from SAE 4140 hot-rolled bar stock, with hardness in a range from 179 to 217 Bhn, machining being on an eight-spindle screw machine. The wheel itself, forged by an outside source from Timken alloy metal, has a diameter of approximately 11 in., and hardness runs in a range between 28 and 34 Rc.

In the original designs, as has been said, the shaft was fastened with three bolts to the wheel. Fatigue tests established that the drilling of the holes for the bolts weakened the wheel and set up stresses in it, and



ABOVE

FIG. 2—The setup for flash welding the shaft to the rotor wheel is shown here, with an assembly in place ready to be welded. At right can be seen the fulcrum end of the lever which is manually held to bring the pieces tightly together during the flashing cycle. The assembly has tensile strength of 125,000 psi.

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the bolts themselves were of course susceptible to fatigue failure. The Ford production cycle sought to end these stress problems by welding the pieces. The butt end of the shaft is machined perfectly flat and, when ready for flash welding, matches exactly the diameter of a boss on the rotor wheel. The wheel is mounted into a fixture on the welding machine, fig. 2, where it rests against a headstock lined with a copper ring for better conductivity. The shaft, previously quenched in oil from 1560°F but not drawn is mounted into a fixture which is manually moved toward the wheel, set screws bringing the pieces to precise fit after contact is made. The shaft is clamped into place with current-carrying dies of copper each 3 in. long, which are two conductors connected to a transformer by copper secondaries. The manual control is maintained in a 110 v circuit. During welding the clamp nearest the headstock is cooled by running water, preventing heat from traveling more than ¾ in. from the welding zone.

Flashing time is 15 sec. After welding, the work is allowed to cool in the water-cooled fixture for 4 min to assure that no heat gets past the welding zone. Air cooling then follows. The flash is chiseled off by hand, the shaft rough turned on a lathe, and the radius ground. Then the piece is annealed for 2 hr at 1040° to 1100°F.

The assembled unit of shaft and wheel then is ready for assembly with the buckets. These buckets are made of Vitallium, a cobalt-chromium-molybdenum alloy

Precision casting of these buckets was comprehensively described in THE IRON AGE, Feb. 10, 1944, p. 52.

with melting point of approximately 2500°F. Each one is a precision casting held within 0.005 in. on all dimensions at casting, measuring approximately 1¾ in. overall by ½ in. wide, the gas chamber being approximately 1 in. long. When each bucket comes to the manufacturer from the supply source it carries a locator boss about 3/16 in. square on what will be its outer diameter, and the other end is shaped somewhat like a V, with each side bowed in. After assembly, these open spaces form a groove on each side of the wheel in which weld metal is deposited.

These buckets are assembled in a heavy jig, fig. 3, slotted to accommo-

RIGHT

FIG. 4—Welding of the buckets to the wheel. The heavy jig prevents any distortion which might be caused by the welding; heat treatment which follows relieves any stresses which may be in the structure.

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FIG. 3—Girls assemble the supercharger buckets in a jig which accommodates 144 of the pieces set flush against each other. After loading, the jig goes to a preheating furnace before welding.

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date the locator bosses on the buckets. When the buckets are set in flush against one another there are 144 of them, as specified. The wheel is then placed in the center of this ring of buckets and the loaded fixture is preheated in a furnace to a temperature of 600°F.

A definitely precise procedure of welding is specified. No. 316 M stainless steel 3/16-in. rod is employed. A central bead, in the nature of a tack weld, is laid down all around the circle, fig. 4. The fixture is then turned over and a similar bead is laid on the reverse side. This permits downhand welding at all times and tends to reduce the possibility of distortion. The fixture is then returned to its original side and two shoulder beads are laid, one on the inside and one on the outside. Together, these entirely cover the original tack weld and, of course, act somewhat as a tempering agent on the work itself, because the heat generated by them on the piece is lower than the original welding temperature. The fixture is then reversed once more and two shoulder beads laid on the reverse side.

After this welding cycle, the work is returned to a furnace for stress-relieving heat treatment. It is brought to temperature as fast as possible and held for 1 hr at 980°F. It is then allowed to cool at the rate of 100° per hr until it reaches a level of 600°F, after which it is air cooled to room temperature.

Lathe work then rough forms and finish machines the shaft, by stepping it down to the various dimensions required, the tolerance being 0.005 in. The shaft is then ground, the two bearing surfaces being held to within 0.0002 in.

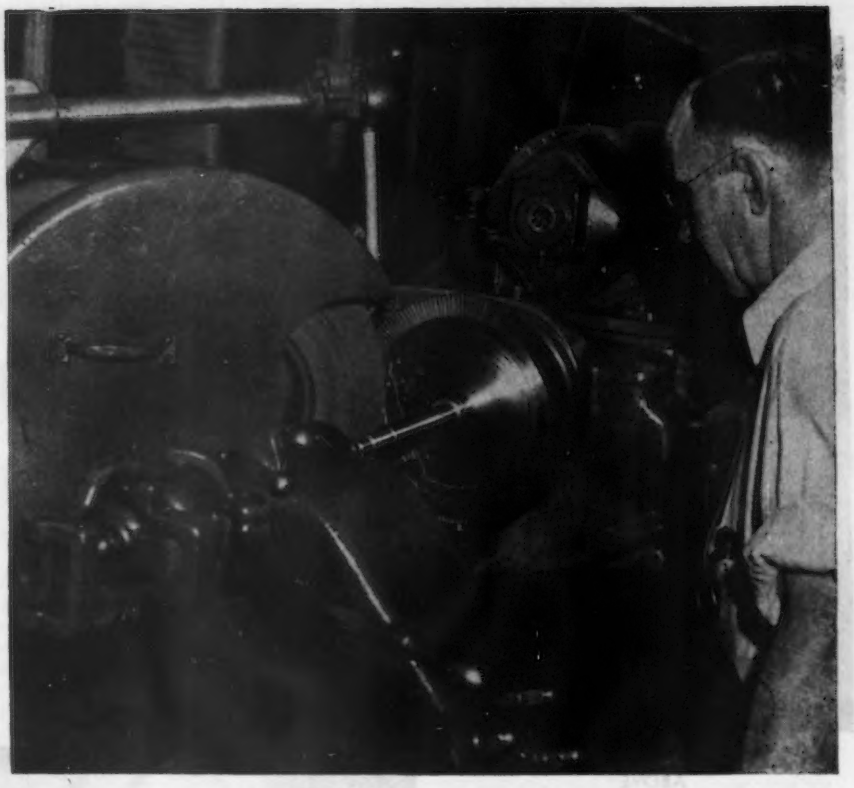

FIG. 5—An excellent view of the rotor wheel assembly is afforded in this photograph, showing the piece in position for grinding of the face. Metal removal is concentrated at the weldments of wheel and buckets, and wheel and shaft. Subsequently the circumferential band around the buckets is finished to close tolerance.

The grinding of the face then follows, fig. 5, with locators removed and the outside band finished within 0.002 in. A hand cleaning operation follows at a bench where all edges and buckets are polished with fine emery cloth and pencil grinding wheels, fig. 6. Balancing-out then follows, and the wheel must balance to 0.2g, both statically and dynamically.

The unit is then assembled for high-speed testing, and all wheels must withstand spinning at 31,000 rpm. Indicative of the tremendous tension stresses set up by this spinning is the fact that each of the 144 buckets in a ring has a pull of from 9 to 10 tons when it spins at that speed. However, pullouts are rare and wheel failures all but nonexistent. It is notable, however, that in this high-speed spinning operation a general tendency to stretch out is noted in the wheel; its diameter increases somewhere around 0.001 in. After this arduous testing the wheel is blasted with 120 grit sand, merely as a surface cleaning operation. Following a semi-final inspection the shaft is put on a superfinishing machine where the bearing journels are honed to a finish of approximately 4 m in. In this operation, as in several others, it is interesting to note that air gages are used to measure accuracy. Reinspection follows, after which the piece is transferred to the government.

The final piece weighs 22 lb 12 oz, a notable saving from the 27-lb weight of the original. In addition, manufacture is speeded and a stronger unit is created, able to withstand much greater centrifugal force. The importance of this latter attribute can hardly be overestimated, because the higher speed improves the effectiveness of the supercharger at higher

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TABLE I

Sand Specifications for Diaphragm Cores
(Quart measurement used throughout.)

	Sharp Sand	Silica Sand	Bank Sand	Core Oil	Cereal Binder	Dixie Bond (Bentonite)	Core Wash	Time	Temperature, °F
Gate core	350	.....	.....	4	8	4	Pollard Hi	1:25	520
Center core (drag)	350	.....	.....	5½	10	10 (silica flour)	Silica wash	2:00	560
(faced with)	280	.....	70	6	10	.....	Pollard Hi	1:25	520
Strainer core	.....	210	140	18	4	8½ (iron oxide)	Silica wash	1:30	560
Sprue core	280	.....	70	12	12	12 silica flour 10 core paste	Silica wash	1:30	560
Vane core (ring)	350	.....	.....	11	10	.....	Pollard Hi	1:25	520

Heap sand is old sand from shakeout, together with new bank sand and Bentonite at operator's discretion.
Facing sand is 50 pct old sand, 50 pct new (1500#) sand, plus 1 pct sea coal and 10 pct Bentonite.
Silica wash is compounded of 60 qt water, 2 qt Bentonite, 2 qt Glutrine, 50 qt silica flour, 4 qt core paste, 17 qt clay flour, and ½ qt dextrine paste.

altitudes and raises the ceiling for a plane employing one.

The second major section of the turbosupercharger is the nozzle diaphragm, fig. 7. This casting is designed to direct the hot exhaust gases to impinge directly onto the buckets of the wheel. This produces the power which rotates a forged aluminum alloy impeller situated in the air compressor casing. In turn, this impeller feeds enough air to the carburetor at high altitudes to maintain an approximate sea level pressure. The diaphragm consists of a central solid portion of about 10 in. diam, from which protrude 46 vanes of approximately 2-in. length. These are held into position by an outer ring, the casting in all measuring approximately 16 in. in diam. The vanes themselves are teardrop shaped, measuring ¼ in. at the thickest section and tapering to a thickness of 0.060 in. Finished weight of the entire piece is approximately 14½ lb.

This part is made of Ford valve metal, a stainless steel alloy of the following specifications: 0.70 to 1.20 pct C; 0.60 to 0.80 Mn; 15.0 to 16.0 Cr; 13.0 to 15.0 Ni; 2.00 to 3.50 Si. This metal has a melting temperature of approximately 2500°F. It is poured between 2950° and 2975°F.

Specifying of the cores and design of the molds posed a pretty problem for Ford foundry experts. To start with, the vane cores presented a serious problem. At the beginning a separate core was made for each vane, then pasted together to make the assembled core. This was replaced by the use of a one-piece core for all the vanes, fig. 8, a most important contribution to production speed, economy and precision.

Because the thickness of the part varied so considerably in its different portions, it was necessary to do a great amount of experimental work with gating and risers. This work, designed to turn out as porous-free a casting as possible, had also the equally important objective of producing an extremely precise piece, because not only was the metal difficult to machine, but its contours in that form were so involved that machining of many surfaces was all but impossible. After considerable development work, gating was introduced at the center which flowed the metal through a complicated structure under fairly good back-pressure, its dimensions having been a subject of continued experimentation to achieve this end. Final dimensions were reduced slightly from original concepts, picking up velocity at the expense of metal flow volume. Risers on all bosses, which were specified ¾ in. thick, helped to eliminate shrink in the feedback. As cast, with this considerable number of risers, the piece weighs approximately 67 lb, the weight after sawing of gates and risers being 25 lb. Finishing of the piece is largely a matter of machining both faces of the outer ring and milling down the outer edge to 0.090 in., which is retained as a means of eliminating possible distortion. The finished weight of 14½ lb is obviously a small yield from an original casting of 67 lb, but in view of the complexity of the piece it appears to be a good percentage indeed. All of this machining is done on a six-spindle standard Bullard.

About 1 out of 20 castings is rejected at the foundry on visual inspection, mainly because of misruns. All pieces go through this visual inspection, after which representative samples from each heat of metal are X rayed. Any cause for rejection in any of the X rayed specimens is reason for immediate X ray of all pieces from the questioned heat. Results of the X ray examination seemed to confirm the effectiveness of the visual inspection, for less than 2 pct of castings which progress to that state fail to pass on to the machine shop. Loss in the machine shop is below 1 pct after initial experimental work in the early

ABOVE

FIG. 6—A bench operation cleans up the rotor wheel-shaft assembly. Operators use emery cloth and mechanically driven pencil grinders to tailor these pieces before they are honed.

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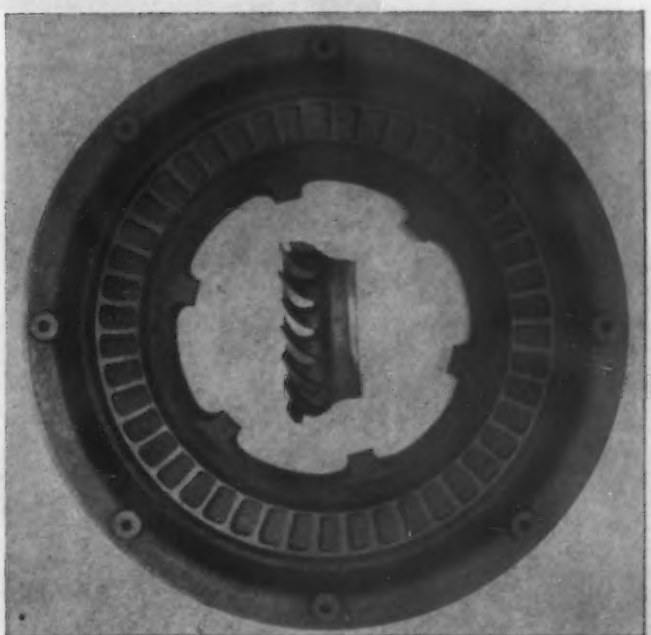

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FIG. 7—The Ford cast diaphragm is shown in the cast condition; note the clean appearance of the piece. In the center is shown a cross-section of the piece, giving a graphic idea of how the vanes can be cast in streamlined shape to improve the flow of air. Originally, in the welded construction, these vanes had to be straight-sided

stages of the contract eliminated warpage and other problems.

A word should be said about the cores involved in this casting. No less than seven specifications are employed in making the different cores used therein, as shown in table I.

By producing this piece as a casting rather than a welded structure, Ford engineers were able to streamline the shape of the vanes to create better airflow, a marked improvement over the flat vanes which were originally necessitated by the fabricated design. Production speed was vastly enhanced due to the elimination of 76 welding operations on the 38 vanes originally utilized in the piece. Additionally, the weight of the entire structure, including the wheel and its enclosure, was reduced from 33 lb 8 oz, to 32 lb.

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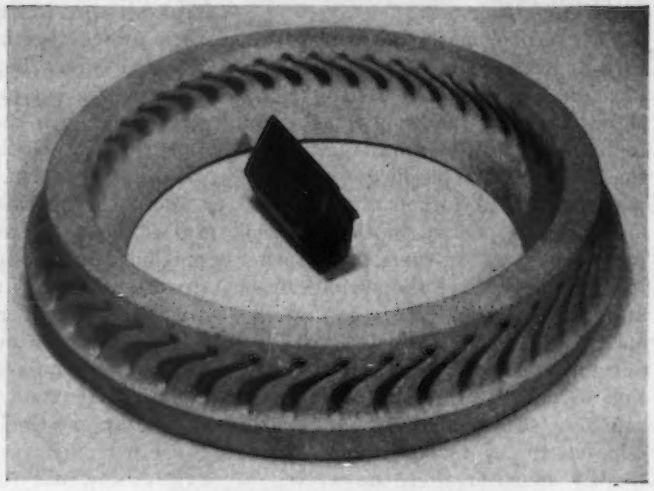

FIG. 8—The one-piece core for the diaphragm is shown here, together with one of the 46 metal inserts used in its construction. Development of this integrated core was one of the milestones in the Ford success story on the turbosupercharger.

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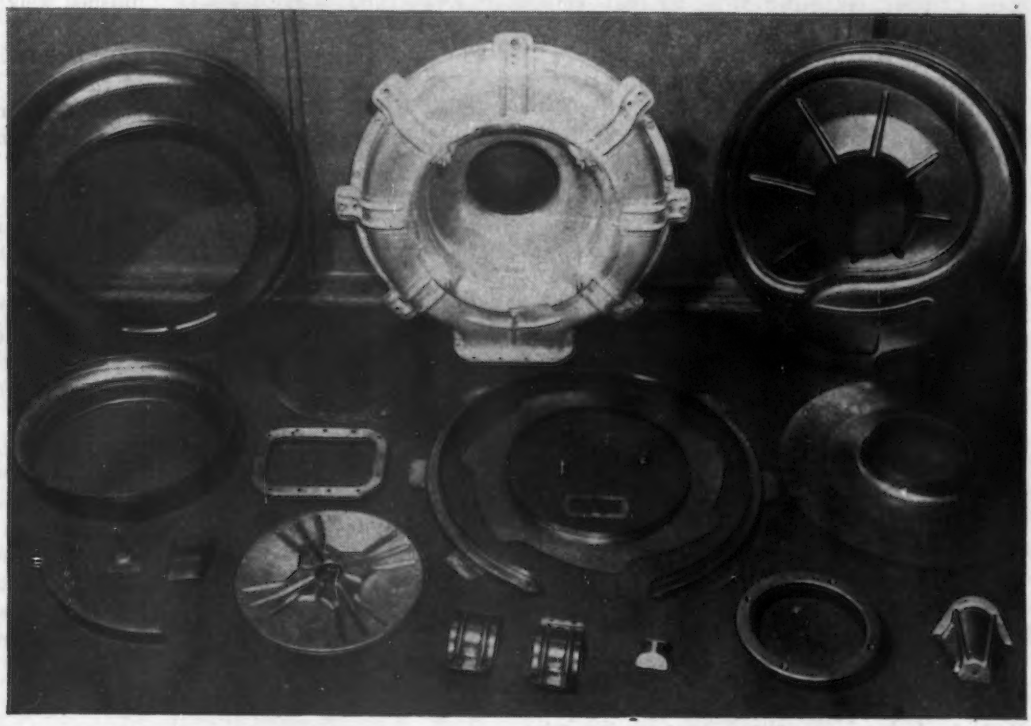

FIG. 9 — Spread out are the varied components of the compressor casing; at rear-center is a final assembly. These pieces are stamped out of light steel, then welded. Extreme precision must mark all the welding assembly steps, but complex fixturing makes this possible with comparatively inexperienced operators.

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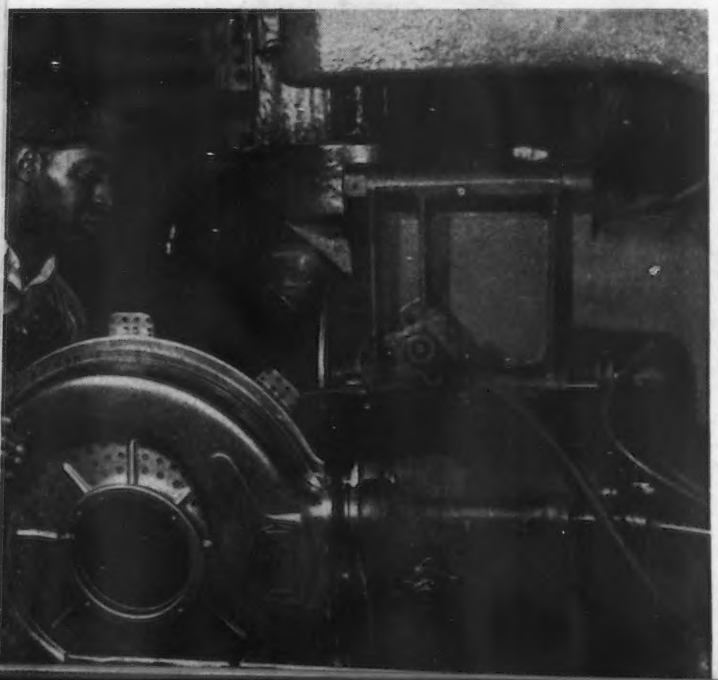

FIG. 10—The operator is ready to begin seam welding of the compressor casing flange. Cold water cools the work during the operation.

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The compressor casing is a marvel of welding technology. Originally this was specified as a cast aluminum alloy piece weighing 33.5 lb. Once again the Ford people turned this original specification upside down, emerging with a welded structure of low-carbon sheet steel weighing 35.5 lb—the only increase in weight in any of the components, and one which was overbalanced by weight savings elsewhere. To more than compensate, savings were effected in the cost of material, and the ingenious succession of welding setups employed at Ford also resulted in a major time saving on the entire operation.

Ordinary low-carbon cold-rolled steel in three different light gages was

specified to substitute for the casting. A progressive production line of welding operations gradually resulted in assembly of the various pieces, which include seven diffuser blades, one diffuser plate, one inner cap, the front shell, the rear shell, seven brackets, a flare weld ring, an inlet flange and an outlet flange, fig. 9. In all approximately 1100 spots are welded, along with 156 in. of seam welding, fig. 10. The 93 separate welding operations, include 70 spot welding stations, 6 seam weldings, 14 arc weldings and 3 acetylene weldings.

To describe this processing in detail is impossible except by blue print and description of each machine station. Suffice to say that in order to reach the work with welding current, great ingenuity in electrode design and fixturing had to be manifested, fig. 11. Electrodes curl in semi-circles to reach the work, or come up in erratic steps. At every machine, pipe or bar fixtures position the work for most effective operation. The operators, nearly all of whom were inexperienced at the start, gradually acquired skill to the point where they could put in a row of a specified number of spots in really quick order, using the eye alone to space them out properly. Control over the operation of these machines was maintained by tensile tests run on each product every 2 hr, and this time span was the average for dressing of the electrodes. All the operations are electronically controlled.

FIG. 11—At this station, brackets are welded onto the compressor case. The inside of the compressor can be reached at this state only from its open inner circumference, so the lower electrode must be curved to reach the work.

After the welding of this extremely involved structure is completed, a stress-relieving treatment is given at 750°F in ovens where the work is held for 1 hr before it is subjected to air cooling. Each piece is then cadmium plated, sufficiently to withstand corrosion imposed by a 250-hr salt spray test.

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THIS rivet sorting machine, made entirely of scrap metal by employees in the riveting department of the Glenn L. Martin Co., Baltimore, takes up where the sorting machines already in operation are not capable of separating a new type of countersunk rivet having a 100 deg head from rivets of the same shank size with a 115 deg. head. It is estimated that during the existing year, this machine will save as much as 20,000 manhours that might have been consumed if hand sorting had been continued. Perfect segregation is possible by means of the inclined screen which oscillates at the rate of 140 cycles per min. The 100 deg rivet heads are a few thousandths of an inch smaller and pass through the screen while the 115-deg rivets remain on the top of the screen. Other screens may be easily substituted to permit sorting of items, such as nuts, screws, washers, etc.

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Selection and Use Of

Diamond Tools

. . . The many different applications of diamond tools, the types of tools, and the technique for using them were all described by the author last week. Herein, in the concluding section of this two-part article, the author deals with machine tool design for using diamond tools, wheel dressing, diamond abrasives, etc. The data herein have been compiled by the author for the ASME Special Research Committee on Metal Cutting and will form a part of the ASME Manual on Metal Cutting.

o o o

By EDWARD L. MURRAY
Warner & Swasey Co., Cleveland

o o o

THE design of any machine tool which best utilizes the diamond as a cutting medium should incorporate several basic features.

(1) The speed range must provide minimum cutting rates for various materials, generally in accordance with the values shown in tables VI and VII. A variable range of speeds from low to high is not essential, but the top speed must be considered both from a standpoint of economical production and freedom from machine vibration.

(2) Spindle bearing clearances must be close and be provided with adequate lubrication. The spindle must be free of loads in one direction only.

(3) Since high spindle speeds are usually utilized, a brake mechanism should be provided to stop the spindle if a minimum time cycle is to be realized.

(4) Special care must be given to guides and slides since work tolerances often exceed the precision of construction of the machine itself.

(5) Very fine feeds are required (see table VI).

(6) Means for precise adjustment of the diamond tool for size control must be provided, as well as some means of quickly withdrawing the cutting edge radially and axially before removing the work piece.

In addition to the generating of single-point metallic and nonmetallic surfaces, the diamond is an important adjutant in the field of metal processing by grinding with vitreous wheels.

The self-renewing action of any grinding wheel is limited to a degree and auxiliary means of dressing or truing the wheel must be adopted. Diamonds possess the qualities of hardness and wear resistance necessary to produce a true running and clear surface on a grinding wheel.

The choice of suitable truing tools is influenced by conditions of service and on that basis it is necessary to differentiate between:

(1) Grinding wheels for rough work on which the parts are ground by hand feed.

(2) Grinding wheels for precision work for cylindrical, internal and flat surfaces with automatic feed.

(3) Abrasive wheels for tool makers' grinding machines.

(4) Grinding wheels for precision work for profiled surfaces, such as threads and gear teeth.

For truing group No. 1, corrugated steel disk, star-wheel dressers, rotat-

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FIG. 12—New recommendation for the correct truing of grinding wheels. The truing diamond contacts the wheel (Wh) at P in the center line O_1O_2 of wheel and piece (Wo). The diamond shank is inclined in reference to the center line at an angle of 10° to 15°.

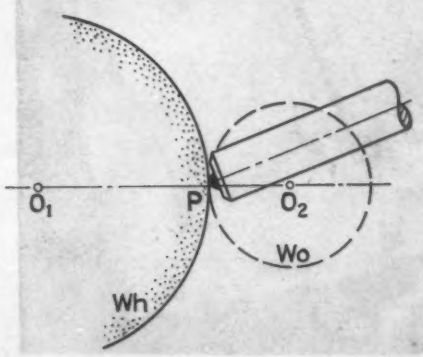
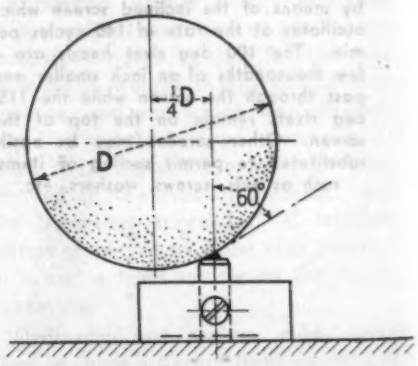


TABLE IX

Standard Grit Sizes for Norton Diamond Resinoid Wheels

100S 120 150	For resharpening, offhand, ordinary roughing tools. For surface grinding, cylindrical grinding and internal grinding to a good commercial finish. For cutting-off, grooving and form-grinding.
220	For Finish grinding, offhand; also for various precision grinding operations where a high finish is required. For hand hones.
240 320 400	For fine finishing, especially boring tools. No. 320 is also a popular size for hand hones.
500	For lapping extremely keen edges, as required for certain boring tools. (It is furnished at considerably higher price to cover additional sizing costs.)

FIG. 13—Recommended position of diamond for truing the surface of the wheel. The correct contact angle of 60° is obtained when the center of the wheel and the center of the shank are displaced by 1/4 D, where D is the diameter of the grinding wheel.



ing abrasive wheel dressers, abrasive stick dressers, and similar tools are applied.

For final dressing of groups Nos. 2 and 3, natural diamonds of rounded shape are best. For group No. 4, in general, natural diamonds of pointed shape predominate; cut diamonds lapped to desired shapes are used for special work.

Some suggestions relating to the choice of industrial diamonds for dressing abrasive wheels are as follows:

(1) Quality: Diamonds in general are not always suitable for the dressing of abrasive wheels. As most Africa boarts are characterized by sharp edges and points, they are usually fit for the purpose of wheel dressing. However, Brazilian boarts are said to be somewhat more resistant to abrasives.

(2) Form: Diamonds without cracks are preferable to withstand heat generated. The hardest stones with as many sharp corners as possible are preferred so that the stone may be set firmly in the holder and reset when required.

(3) Size: For efficient truing of grinding wheels, the size of the diamond must be chosen in suitable relation to the diameter, width, and granulation of the grinding wheel. For suggested values of diamond weights for different sizes of wheels, see table VIII.

Equally important as the choice of diamond for wheel truing is the use or treatment of the stone in the shop.

Radial depths of finishing cuts should not exceed 0.001 in. to 0.002 in., several light cuts being better than one heavy cut. Usually, the speed of the wheel should be equal to the operating speed so that stress conditions may be duplicated.

The feed of the diamond tip parallel to the axis of the wheel may be varied to suit the condition of the job. A hard wheel may be made coarser by using a coarse feed and vice versa. Usually grinding wheels are trued by hand feed, although automatic feed is preferred, particularly so on centerless grinding wheels.

The adjustment of the diamond in relation to the wheel is very important. Current recommendations for positioning the diamond are shown in fig. 12.

Fig. 13 shows the correct position of the truing diamond for dressing the wheel of a surface grinder.

TABLE X

Standard Grit Sizes for Norton Metal Bonded Diamond Wheels. For Cup-Shaped Wheels and Grinding by the Offhand Method Unless Otherwise Indicated.

100S—Rough grinding single point tools; also for cut-off wheels. As a rule, it should not be necessary to use metal bonded diamond wheels any coarser than 120 grit, even for roughing. This is particularly true of tools tipped with the hardest grades of cemented carbide.

120—Rough and finish grinding with one wheel. For reconditioning the general run of single point tools, 120 grit metal-bonded wheels have been found to give uniformly best results. This grit size will produce a clean, sharp cutting edge, comparable as a rule to that obtained with a 220 resinoid-type diamond wheel, and at the same time remove stock rapidly.

150—Rough and finish grinding with one wheel, with particular emphasis on high finish and keen cutting edge.

220—Fine finishing or lapping.

Diamond Abrasives

A further use of the diamond in the metal-cutting industry is as an abrasive. Various forms in which the diamond is so used may be listed as follows:

(1) As loose diamond grain or dust.

(2) As diamond dust mixed with other abrasive powders.

(3) As diamond dust mechanically rolled in or charged to a metallic or nonmetallic body.

(4) As diamond grain bound in another material.

As all four forms above involve the diamond in powder or grain form, some explanation of the manufacture of diamond dust is in order.

Diamond boart (small diamond crystals or fractions unusable for other purposes) are reduced to granular form by hand operated or machine operated mortar and pestle arrangements. This crushed material must then be uniformly graded so that shear stress and compression load are distributed evenly in use over all grains. For the grading of powders, stepped sifting and decanting processes of various descriptions are in use.

Sifting or shaking the crushed powder through the finest available wire screen will grade the diamond dust up to a grain size of about 0.001 in. A wire screen with 350-400 mesh per in. is required in this instance and the resulting powder or dust is ordinarily satisfactory for most rough abrading.

To obtain finer grades of dust, grains of a screen mesh size preferably above 300 are decanted or centrifuged in various fluids. The decanting or pure sedimentation process is older and somewhat lengthy. For details of one method of grading by oil-decanting see Machinery's Handbook, 11th edition, 1941, p. 1014.

A newer process, that of grading by centrifugal action permits a more definitive separation of grain sizes in a shorter time period than possible by decanting.

Depending on the application, the use of pure diamond dust sometimes acts too fiercely and quickly, leaving fine scratches on the surface. For fine grinding and polishing work, for instance polishing of holes in sintered carbide disks, a mixture of diamond dust with some other abrasive dust such as tripoli, rottenstone, rouge, glass powder, etc., is used to reduce the cutting rate.

Sometimes diamond dust is rolled or pressed into a metallic or nonmetallic body for use as a rotating diamond lap for precision finishing of holes too small for grinding by abra-

TABLE VIII

Diamond Weights for Different Wheel Sizes

Wheel Diameter		Wheel Width		Average Diamond Weight, Carats
In.	mm	In.	mm	
Hardness M (Norton) and Softer				
up to 6	up to 150	up to 1	up to 25	½ to ¾
6 to 12	150 to 300	1	25	¾ to 1
12 to 18	300 to 450	1 to 1½	25 to 38	1 to 1½
18 to 24	450 to 600	2 to 4	50 to 100	1¾ to 3
over 24	over 600	.....	.....	2 to 6 according to diameter and width
Hardness N (Norton) and Harder				
up to 12	up to 300	up to 1	up to 25	1
12 to 18	300 to 450	1 to 1½	25 to 38	1½ to 2
18 to 24	450 to 600	2 to 4	50 to 100	2 to 3
over 24	over 600	.....	.....	3 to 6 according to diameter and width

sive wheels. Although frequently used, this treatment or usage is wasteful of the diamond powder.

The use of diamond dust in bound form, as in an abrasive wheel, has several currently popular applications. Of these applications, one of the most pertinent concerns the lap-finishing of sintered carbide tipped tool edges for the purpose of increasing tool life and work finish.

Two types of bound wheels are in common use:

(1) Phenol-resin-bound wheels

(2) Metal-bound wheels

PHENOL-RESIN-BOUND: This type wheel is manufactured with various grades of diamond grains. Recommended peripheral speeds range from 4500 fpm to 5500 fpm.

As an economic measure, only definite surface layers are provided with the material in which the diamond grain is bound.

Wheels of the phenol-resin type are supplied with thicknesses of the abrasive layer in four steps between 1/32 to ⅛. For side-grinding wheels all four thicknesses are recommended, whereas, for peripheral grinding only coatings about 1/16 in. are finished.

Phenol-resin-bound diamond wheels are furnished in various grit sizes to suit particular purposes. One manufacturer's recommendations are shown in table IX.

Bound wheels are also furnished with various degrees of diamond concentration as follows:

(1) High concentration

(2) Medium concentration, 50 pct of (C)

(3) Low concentration, 25 pct of (C)

High concentration (100) wheels are recommended for fixed-feed precision grinding such as cylindrical surfacing, internal and cutter grinding. This concentration is always recommended for peripheral grinding wheels.

Medium concentration (50) wheels in the finer grit sizes are recommended for constant pressure grinding. These wheels are usually cup or recessed wheels. Cup or recessed wheels of low (25) concentration are recommended in the coarser grit sizes for use in free-hand grinding.

Grinding temperatures in excess of 600° F. will char and weaken the phenol-resin-binding, causing excessive wear. Consequently, the use of a coolant or lubricant is advisable for all operations. Kerosene, low-ratio oil-water emulsion, or low-alkaline grinding solutions are satisfactory fluids.

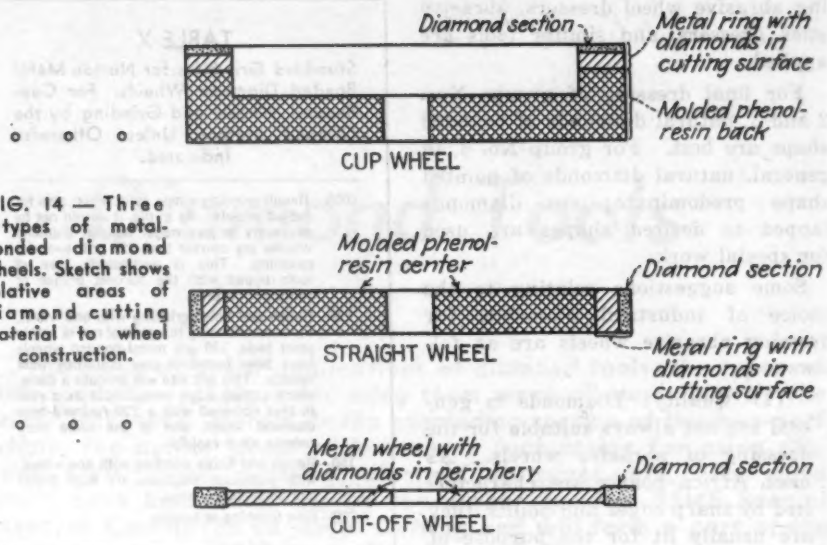


FIG. 14 — Three types of metal-bonded diamond wheels. Sketch shows relative areas of diamond cutting material to wheel construction.

Smeared or glazed wheels may be cleaned by rubbing the wheel with a cloth soaked in kerosene or mineral oil or by dressing lightly with a pumice stone or a silicon-carbide stick. In the case of cup or recessed wheels, face trueness may be restored by lapping the face on a porous cast-iron flat, or glass surface on which a fine abrasive powder and oil paste have been applied.

The metal-bound type of diamond wheel may have a phenol-resin body but the diamond particles are held in a soft metal band or rim. (See fig. 14.) The diamond layer is usually of a lesser thickness than in phenol-resin bound wheels due to its inherent slower rate of wear.

Metal-bound wheels also come in various grit sizes. (See table X.) A metal-bound wheel will produce a finer finish than a phenol-resin wheel of the same grit rating, with a consequent reduction in the maximum fineness of grit required. These wheels may also be operated at peripheral speeds of 4500 fpm to 5500 fpm.

In contrast with phenol-resin wheels, metal-bound wheels may be used dry, but similar lubrication or cooling is still desirable.

Cut off wheels of either variety absolutely must be used with fluid coolants or lubricants, as described.

Generally speaking, phenol-resin bonded wheels are desirable where fast grinding in production is required. They are also better adapted to fixed-feed precision grinding operations for reasons previously outlined.

The metal-bonded wheel is slower cutting but has an extremely low rate of wear and produces superior finish for a given grit size.

Neither type diamond wheel should be used for grinding steel, as this process tends to load or smear the wheel.

The use of the bonded-diamond wheel in the shop for lapping sintered-carbide tool tips is simple.

Fig. 15 illustrates how the steel shank should be just pre-ground or relieved on an ordinary grinding wheel. Fig. 16 illustrates the use of a disk-shaped diamond wheel for finish lapping the cutting edges. Ample pressure should be applied and the cutter should be moved back and forth across the face of the wheel.

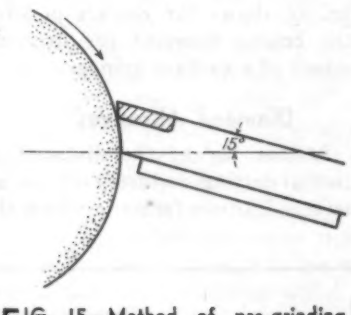


FIG. 15—Method of pre-grinding a carbide-tipped tool on a vitreous wheel.

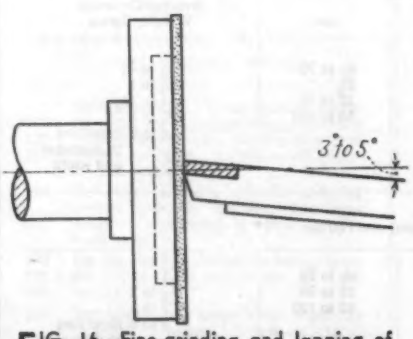


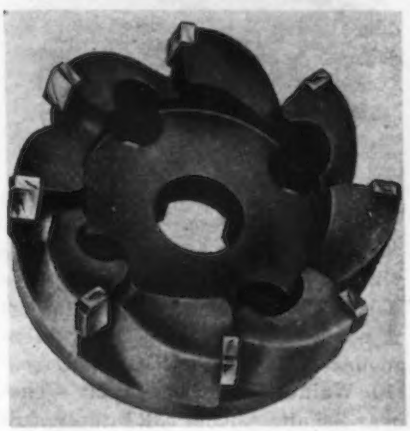
FIG. 16—Fine-grinding and lapping of the carbide tip on a dish-shaped diamond wheel.

New Equipment . . .

Small Tools

. . . Recent improvements in small tools, jigs, special attachments, wrenches and gaging equipment are illustrated and described herein.

CARBIDE tipped milling cutters and end mills have been announced by *Nelco Tool Co., Inc.*, 370 Hamilton Ave., Brooklyn 31. Two and four flute carbide end mills from ¼-in. up to 2-in. diam, large end mills up to 5-in. diam with No. 50



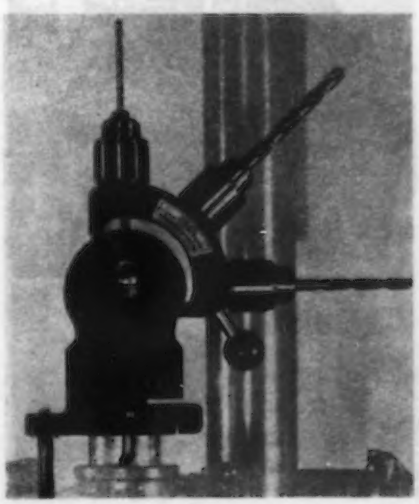
NMTB shanks, shell end mills, face mills, slotting cutters and half side mills up to 8-in. diam are included. An 8-in. Nelco face mill weighs 25 lb. Heavy carbide tips are used to withstand shock, improve tool life and permit regrinds before new tips are brazed in. Another feature is a new design of tool which is said to mill steel on machines of old design or low powered machinery where present carbide cutters will not operate.

Thread Milling Cutters

AN increase in the number of sizes of Detroit standard thread milling cutters has been announced by *Detroit Tap & Tool Co.*, 8432 Butler Ave., Detroit 11. The cutters are available in 12 new shell type cutters, making a total of 52 shell type standards, and 20 new shank type cutters making a total of 32 shank type standards. All of the shank type cutters are available in either Jarno, Morse, or Brown & Sharpe tapers. The expanded line of standards include additional sizes as to width of the cut. The shell type cutters in blank form range from 1½-in. diam and ½-in. face width to 3½-in. diam and 2-in. face width running in ¼-in. steps from the 1½-in. diam. to the 2½-in. diam inclusive and by ½-in. steps above the 2½-in. diam. The shank type cutters range from ¾-in. diam and ¾-in. face width to 1½-in. diam and 1½-in. face width in ¼-in. steps.

Drill Press Turret Head

A DRILL press turret head which incorporates semi-automatic single action indexing of the quadrant has been announced by *Universal Engineering Co.*, San Diego, Calif. Automatic engagement or release of the clutch mechanism is controlled by the raising or lowering of the drill press feed lever. Thrust and radial load is carried through preloaded sealed ball bearings. Load is carried by the turret head and is not transmitted to the drill press spindle. With the drill press in the raised position, the quadrant lever on the turret is shifted, thereby selecting the next operation whether it is drilling, reaming, counter-sinking, counter-boring, spot facing, burring, etc. Only the driven spindle is in motion. The other spindles remain idle. Shifting action involves one moving part. All parts of the turret head are interchangeable.



Turret Drill Head

A TURRET drill head, Madco No. 275, has been announced by *Madco Products Inc.*, 516 Fifth Av., New York 18. The depth stop mechanism which is enclosed consists of a cylindrical drum carrying six adjustable stops which are positioned through an opening in the aluminum alloy housing. The drum is geared to the turret head and automatically indexes when the turret head is turned. No. 1 Morse taper precision ground spindles, ball and detent arrangement to indicate correct indexing position, friction type

clutch mechanism and a drilling accuracy of 0.001 in. are features of the machine. The turret heads have a ½-in. drilling capacity. The heads are designed to fit practically all types of medium sized drill presses having quill diam from 1¾ in. to 2⅜ in.

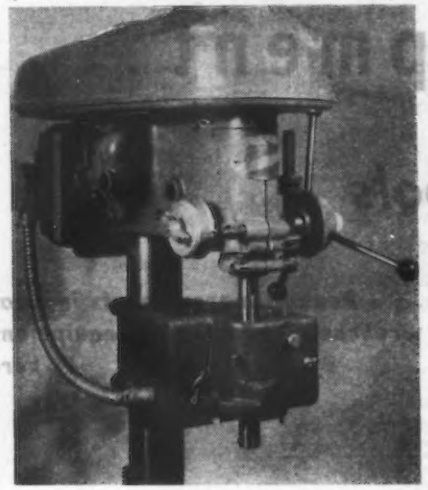
Vertical Jig

A SIMPLIFIED model of the Jiffy Jig for vertical use only has been announced by *Monarch Governor Co.*, 1832 W Bethune Ave., Detroit 6. Except for the bracket that allows for horizontal set-ups, the jig is said to include all the features of the original. The jig chucks are designed to provide ample chip clearance and when the chuck is either open or closed, the collet has absolute

zero axial and rotary movement and positive axial and rotary dimension control. The jig consists of a cap, a base and an operating lever, the taper on the cap conforming to that of the collet. With the proper sized collet in place, the cap is screwed down on the base until the collet opens and closes as desired. It has capacity for stock ranging from 1/16 to 1-in. cross section.

Follower Application

ADAPTATION of the Turchan follower to an ordinary milling machine permitting clutch teeth to be milled automatically instead of with a manually operated dividing head has been announced by *Turchan Follower Machine Co.*, 8259 Livernois, Detroit 4. The automatic set up arrangement is shown below. By automatically controlling the longitudinal movement of the table while the fixture for holding the clutch blank is mounted in the dividing head, the follower enables the cutting tool to reproduce a master model.

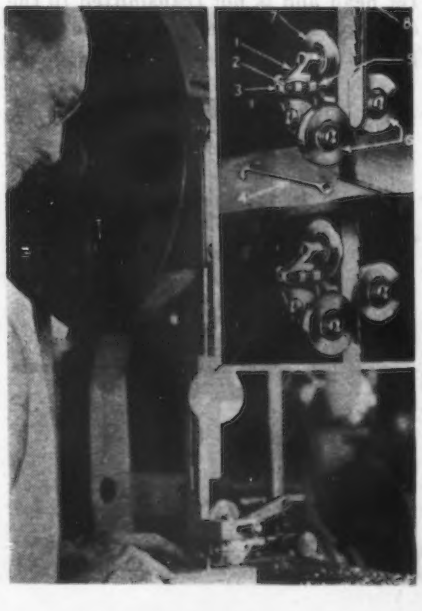


Tapping Attachment

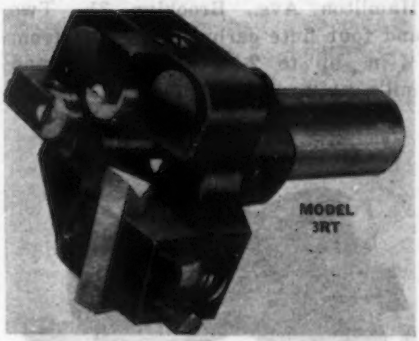
A PRECISION tapping attachment has been announced by *Douglas Machinery Co.*, 150 Broadway, New York 7. It is said to provide automatic control of lead to assure precision tapping as well as control of depth to a tolerance of 0.010 in. The lead screws are hardened and precision ground and enclosed for protection from dirt. Other features include emergency reverse, complete automatic cycle and foot control. It is said that changeover from tapping to driling can be made in 5 min.

Band Saw and Metal Safety Guide

A BAND saw and metal safety guide especially adapted to metal and plastics as well as wood and adjustable to blades ¼ in. to 1½ in. wide has been developed by *Boyer-Campbell Co.*, 6540 St. Antoine St., Detroit 2. It has side guide wheels



mounted in a staggered position to eliminate binding and a grooved back wheel to hold the saw in position. All of these are equipped with double sealed, permanently lubricated ball bearings. Positive adjustment of the mounting arm on the supporting bracket is provided by a set screw which exerts pressure against a 60° pin that in turn presses against the adjusting screw. This eliminates any tendency to loosen or creep. A special 10-in. socket wrench is provided for the set screw and adjusting screw to move the grooved wheel in and out for various width saws. Minor adjustments can be made with a No. 4 wrench while the saw is running. Other models of the same design are available for the smaller sized saws.



Screw Machine Tools

THREE additions to their line of screw machine tools have been announced by *Boyar-Schultz Corp.*, 2110 Walnut St., Chicago 12. The Boyar-Schultz Model 3RT designed for use with both automatic and hand screw machines is available with 1¼ or 1½-in. shank diam. Their Model OOORT tool for turning extra small parts is said to turn parts as small as 0.075 in. Using carbide blocks in place of rollers, it is said that parts as small as 0.020 in. can be turned. A model OOOD floating tool holder has also been announced.

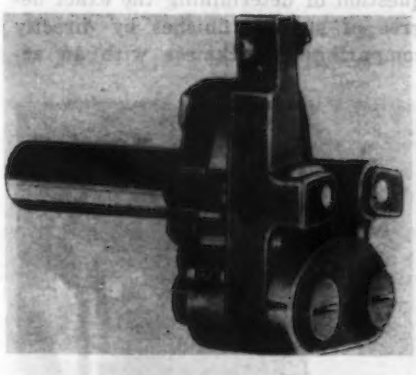
Sharpening Attachment

A SHARPENING attachment has been announced by *Le Brun Mfg. Co.*, 49 Illinois St., Buffalo 3. The attachment sharpens all types of cutters, reamers and end mills. It is used on any small grinder in combination with any lathe. It is composed of a holder for bolting to grinder base, rod and adjustable swivel-type arm. Three points of adjustment provide universal adaptability.

The attachment is bolted to the grinder which is then mounted on the lathe saddle. The cutter or reamer to be sharpened is set up in the lathe. By adjusting the arm of the attachment to set on one tooth of the cutter or reamer, the tooth being sharpened is said to be accurately guided to the grinding wheel.

Knurling Tool

A KNURLING tool, Model K, has been announced by *Boyar-Schultz Corp.*, 2110 Walnut St., Chicago 12. Operated from the screw machine turret, feed and pressure are simultaneously applied to both sides



of the work through cantilever action to exactly the same depth at equal pressure. This action avoids the transverse strains and springing on the spindle which is said to be a common fault with other knurling tools. The tool is made in three sizes, OOK, 0 in. min, ⅜ in. max, the OK, 3/16 in. min, ⅝ max and the 2K, ¼ in. min, ⅞ in. max.

Cemented Carbide Tools

A METHOD of brazing cemented carbide tips to tool shanks which is said to prevent the cracking of the carbide tip and at the same time to permit heavier cuts and longer tool life, has been developed by *Newcomer Products*, 122 Gerard St., Latrobe, Pa. The tips are brazed to tool shanks which do not leave the tip under a brazing strain.

Blank Collets

NO. 2 W. & S. and 5-C types of blank collets for the user to bore and process have been announced by *Zagar Tool, Inc.*, 23880 Lakeland Boulevard, Cleveland 17. The blank is mounted in any standard collet fixture and finish machined to specifications. Instructions are included to

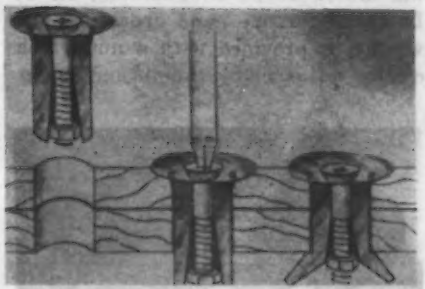
anneal, split with a rubber wheel and spring.

Ball Bushing

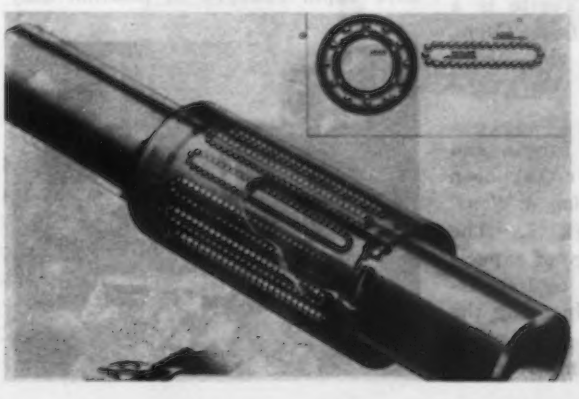
A BALL bushing that permits unlimited travel of reciprocating mechanical members that may be either round or square or variations of these shapes has been announced by *Thomson Industries, Inc.*, 29005 Review Ave., Long Island City. The advantages gained from the use of ball bearings for rotating parts can be obtained on sliding members. The bushing contains within it a series of ball circuits. One side of the circuit carries the bearing load with the other side returning the balls in a clearance provided in the outer race member of the bushing. The continuous bearing is said to prevent cocking or binding on the shaft because the bearing balls remain constantly centered under load. Rolling contact plus sealed-in lubrication enables a long life of anti-friction precision alinement. The system of ball circuits can be infinitely varied for varying load capacities and shapes of bearing members.

Blind Bolt Assembly

A BLIND bolt assembly has been added to its line of plastic fastening devices by *Victory Mfg. Co.*, 1105 S. Fairbanks Ave., S Pasadena, Calif. The unit consists of a molded plastic expansion sleeve and any standard nut and bolt assembly of the correct size to match the sleeve. The sleeve is composed of three thin fingers with an inside taper extending approximately three fourths of their length from the flanged head. The head is a flange with a cored hole to accommodate the bolt shank and countersunk to receive standard countersink type of bolts, with three



sharp ribs attaching the flange and sleeve. These thin ribs wedge into the work and prevent the sleeve from turning.



Torque Screw Driver

A TORQUE screw driver for all hand assembly jobs has been announced by *Apoc Mossberg Co.*, Attleboro, Mass. Inch pounds are indicated directly on the dial without the use of springs. The range is from 0 to 25 in-lb. The torque driver comes with two bits, one for Phillips screws and one for slotted screws, together with an adapter for a ¼-in. square socket to take wrenches for small nuts, studs and socket screws.

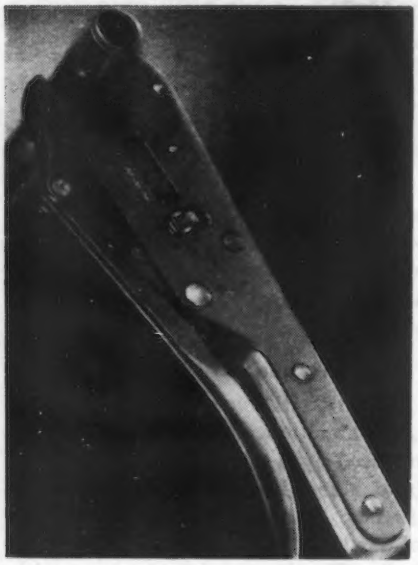
Speed Clamps

A LINE of extra deep throat speed clamps has been announced by *Grand Specialties Co.*, 2135 W Grand Ave., Chicago 22. It is claimed that the clamp can be positioned by simply pushing down on the ratchet screw and tightening with a turn of the loose proof handle. The clamp is said to hold a firm tension grip on any surface, even slanting or irregular and is equipped with replaceable ball and socket swivel to prevent shifting or creeping. The trigger release pawl is said to

have hardened teeth which hold a meshed grip under spring tension on the ratchet screw while the clamp is set. Three sizes are available, 4¾-in. opening, 4¼ in. throat; 6¾ in. opening, 4¾-in. throat; 8¾-in. opening, 6-in. throat. Capacity is said to be 3500 lb.

Wrench

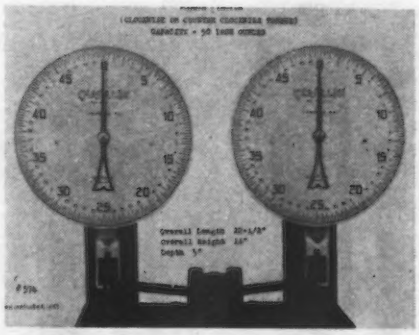
A WRENCH which has more than a ton of gripping power in its steel jaws has been developed by *Botnik Motor Corp.*, Binghamton, N. Y. Designed for one hand operation, the wrench is provided with a nut which can be adjusted by thumb and finger



to regulate the jaws. A calibrator scale and indicator show the width of the jaw opening. The steel jaws are parallel at any opening to provide maximum gripping surface. To grip, the jaws are placed over the work and the round lever snapped shut. The jaws remain locked until the lever is released. A hard drawn steel wire spring controls the locking device. The handle insert of Tenite is fastened to the tool by rivets. The inserts are molded by *Norton Laboratories*, Lockport, N. Y. Tenite is a product of *Tennessee Eastman Corp.*, Kingsport, Tenn.

Torque Tester

FOR determination of torque and force, a torque tester has been developed by *John Chatillon & Sons*, 85 Cliff St., New York 7. The testers are made in a range of capacities of from 50-in. oz up to 1000 ft-lb graduated by 5 ft-lb. In using the torque tester, torque is supplied to the shaft and the resulting force is



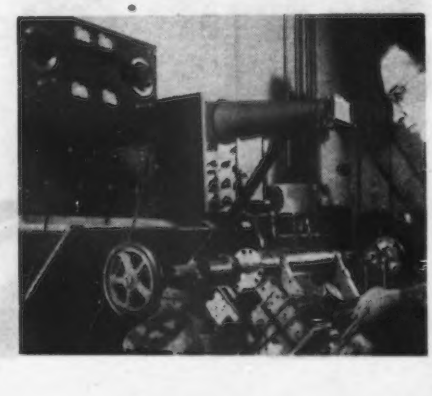
read directly on the dial. The shaft can be provided with pin, vise, adapters or other fittings to suit the application.

Electronic Gaging Instrument

AN automatic electronic gaging instrument has been developed by *Autotron Co.*, P.O. Box 722, Danville, Ill. The unit is capable of automatically gaging a wide variety of small parts either metal, plastic, ceramic, glass or paper. The machine can gage the depth of holes, external lengths and outside diameters to very close tolerances. It operates at a speed upwards of 3300 pieces per hr. Speed of the machine depends upon the size, shape and manner in which the part to be gaged can be handled. Mechanical contact is made at a desired point in the work by a stylus rod to which a razor-like flag is attached. Image of this flag is projected into an optical system by light. A high order of magnification is produced causing a show of this flag to be projected and reflected onto a panel of two photo electric tubes. Distance between these two tubes represents the tolerance of the dimension being gaged.

Electrical Micrometer

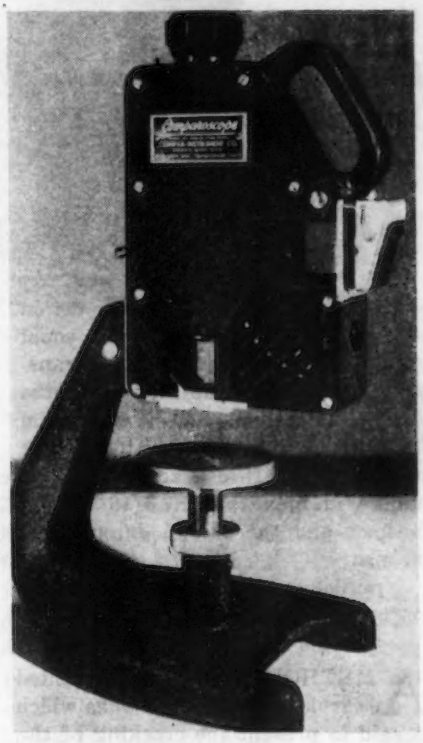
AN electrical micrometer for measuring movements or changes in position as small as one tenth of a millionth of an inch has been announced by *Battelle Memorial Institute*, Columbus 1, Ohio. It can measure rapid changes in position only



one thousandth as large as the thickness of the printing ink on a newspaper or about one fifty-thousandth the thickness of newsprint. It is said to be capable of recording changes much smaller than the wave length of light which is the standard used in calibrating it. It uses the principle of "static free" FM to measure the position of either slowly or rapidly moving objects without touching the object being measured.

Dual Comparing Microscope

A DUAL comparing microscope, the Comparoscope, has been announced by *Compar Instrument Co.*, Detroit. The instrument solves the question of determining the exact degree of surface finishes by directly comparing a workpiece with an ac-



cepted standard or master. It contains its own directed light source and is automatically in focus on both specimens regardless of their size. A stand equipped with an adjustable stage makes the instrument a self illuminated shop microscope by moving a slide on the side. This eliminates the image of the master stage and the entire field of vision is available for the inspection of tools and specimens placed upon the stage. An eccentric lock unclamps the instrument from its stand when it can be used directly on the job. The comparoscope has a special transformer and is shipped in a case provided with compartments for various specimens.

ONLY 1 HARDINGE

Style "B" Master Feed Finger with interchangeable pads saves ALL this

THE illustrations graphically show the material saved when a HARDINGE Style "B" Master Feed Finger and interchangeable Pads are used instead of conventional solid feed fingers. Although this saving has been going on in screw machine departments using Style "B" since 1928, it is now more important than ever before as the economy not only saves money for you, but also conserves steel which is of vital importance today.

This saving is apparent to you. The many other advantages of using HARDINGE Style "B" Master Feed Fingers with either steel, bronze or nickel cast iron pads will be immediately appreciated when you put them into use. Learn these advantages by asking for your copy of the bulletin illustrated below.

HARDINGE BROTHERS, Inc.
ELMIRA, N. Y

Ask for this bulletin

Every screw machine department should have the complete information given in this bulletin. Available to purchasing agents, superintendents, foremen, engineers, set-up men and operators in organizations which have a screw machine department.

Assembly Line . . .

STANLEY H. BRAMS

• Progress leading to resumption of automobile output is manifested in Detroit in many ways — determinations on prices, huge inquiries for steel . . . Crosley may operate at Indianapolis . . . Payrolls in auto plants continue their ebb flow.

DETROIT—With the skeleton of 1946 automobile pricing established by OPA, manufacturers are striving to provide the flesh of individual model prices. As soon as news broke that the price ceiling would be removed August 31 from most 1946 components, buyers for automobile manufacturers began bargaining for firm price commitments.

Excepting a few parts suppliers willing to sell on a 1942 price basis, orders for 1946 model parts have been sold to date on an open basis—delivery now, prices later.

Removal of the parts price ceiling had the effect of making price determination a direct result of the old but not forgotten law of supply and demand—just such a principle as the automobile manufacturers vainly had hoped would be allowed to guide pricing of automobiles. Competition among parts manufacturers to secure volume orders was relied on to keep prices down, with the OPA holding an admonitory club in the back ground if sharp enough pencils were not used.

Until automobile manufacturing costs can be correlated with profit allowances, Price Administrator Chester Bowles' statement that, "the public is unlikely to pay more for most 1946 model cars than the present ceilings on 1942 models minus special costs," emerges as the sole windsock on price trends. Dealers are uneasy for fear they may have to bear the brunt of any price squeeze, and no reassurance on this matter has been forthcoming from manufacturers.

One thing is sure. Current prices on late model used cars will have to take some sharp adjustment if new car prices are to be near 1942 levels. Current late model used car ceilings in Detroit—and throughout the land—are ofttimes higher, due to reconditioning markups, than were the original list prices on new 1942 models. The dealer ceiling price on a used warranted Ford V-8 super deluxe 4-door sedan is $1243 at Detroit. The original 1942 list price for this car here was $1020. A used warranted Chevrolet 4-door fleetmaster sport sedan sells at a $1216 ceiling compared to the original new price of about $985. A 1942 special deluxe 4-door Plymouth sedan, with dealer warranty, brings $1255 at ceiling as against an original price of about $1015. Thus even before new cars hit the market, the drop in used car prices should be precipitous.

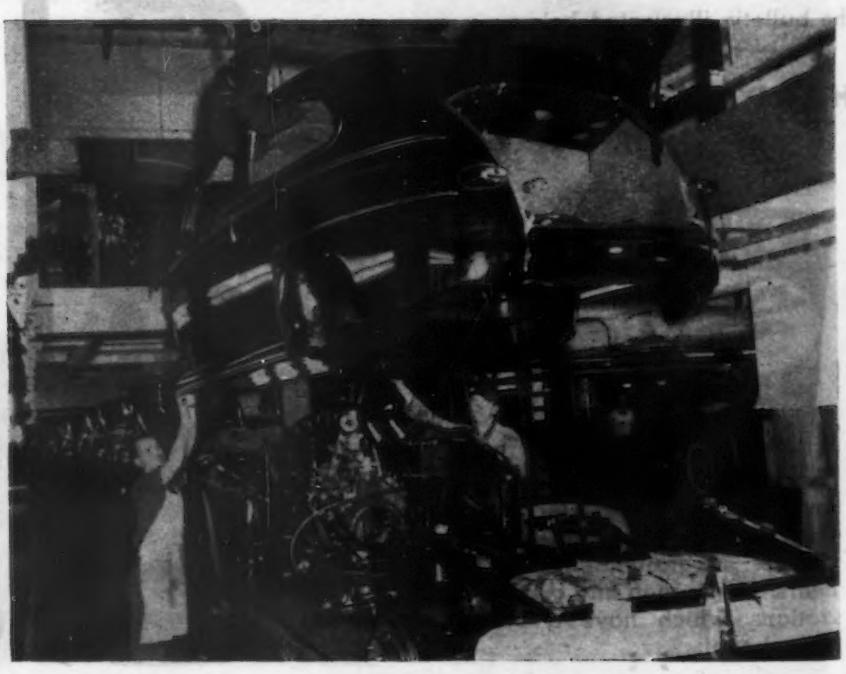
Ford has promised to make its new price announcement at a public showing late in September, and other manufacturers may hang their price tags about the same time. The industry often waits for Ford to set the price pace.

MEANWHILE manufacturers are projecting production curves that will need oxygen at the higher altitudes. Fisher Body buyers have approached steel suppliers on the basis of producing 15,000 bodies a day in 1946. On the basis of a 300-day production year this means some 4,500,000 automobiles by GM alone. Steel requirements would be in the neighborhood of 1,700,000 tons for Fisher alone.

If other manufacturers are thinking in proportionate terms, the industry would be planning a 10,000,000-car year, requiring about equally as many tons of steel. This total, of course, is far beyond even the most optimistic anticipations of the industry.

Such figures, therefore, seem to constitute more of a salesman's dream than a basis for making inquiries for steel, even though they are used latterly. To bring the automobile population up to the early 1942 level would require about 7,000,000 cars. An 11,000,000-car year would indicate either a much larger automobile population or the junking of some 4,000,000 cars during the first full production year—possibly a combination of both elements. Prior to the war the number of cars scrapped

FORD PUSH: *Having gotten the jump on most of the automotive industry in the way of new car production, the Ford organization is now putting on all possible pressure to get into full gear.*



"GREENFIELD MAN" SHOWS HOW GOOD GAGING CAN PRODUCE BETTER THREADING RESULTS

[A GTD SHOW-HOW REPORT]

1 While making a routine tap service call on the "X" Company, a "Greenfield Man" noted that rejects of threaded parts seemed far above normal. Checking further, he found that these parts were gaged only once . . . at final inspection. The gages themselves were "pick-ups" of various makes.

2 The "Greenfield Man" asked permission to call in another "Greenfield Man" who was a specialist in quality control. The customer readily agreed. This "Greenfield" engineer made a thorough study and report on the plant's threading operations from a gaging point of view.

3 The "Greenfield" experts' recommendations were accepted and a complete gaging system installed. Gages were provided for checking size at each key point in the production cycle of the part. Equipment was purchased for checking the gages themselves, and an accounting system installed that insured gages in working condition being ready for every job when needed.

4 Finally at "Greenfield's" suggestion, modern methods for storing, protecting and distributing gages were adopted.

Results!

Through the "know-how" and initiative of a "Greenfield Man" making a routine service call, this firm was able to obtain a complete system of quality control that cut costs, speeded production and reduced spoilage. It shows how "Greenfield", leading maker of both threading tools and gages, can provide a DOUBLE-BARRELLED service to metal-working plants through its country-wide staff of field engineers.

ON THREADING PROBLEMS SIMPLY CALL YOUR "GREENFIELD MAN" THROUGH YOUR "GREENFIELD" DISTRIBUTOR!

GREENFIELD TAP and DIE CORPORATION
GREENFIELD - MASSACHUSETTS

averaged close to 2,000,000 cars per year. Thus the 11,000,000 figure indicates a belief that automobile owners will make up in one year for two years' normal but delayed junking. This must be considered a reasonable anticipation by itself, without regard to the rest of the thesis.

New car demand in the final analysis is not determined by the number of people who wants new cars, but the number who can afford and require them. Since the middle 1920's the growth factor in automobile sales has decreased in importance. New car volume has kept in closer line with the level of general business activity and consumer income. In the past, the early stages of business recovery sales have been slightly ahead of the growth of consumer income. During the 1935-39 period income payments to individuals after federal taxes averaged $64 billion annually, and new passenger sales for domestic use, about 3,000,000 units. By the income yardstick alone an 11,000,000-car year would mean national income of around $234 billion (Ah, Prosperity!) but because of the obsolescence factor in the present automobile population the correlation is obviously unfair. Current optimistic predictions of normal postwar income would mean an ultimate annual automobile production level of about 6,000,000 units, and the more conservative estimates about 4,500,000 units—after the first buying wave ebbs.

MOTOR truck manufacturers are talking of reaching before the end of 1945 a production level close to the average prevailing in 1937. That was the biggest peacetime year the industry ever experienced. This expectation is borne by Richard T. Purdy, manager, motor truck division, Automobile Mfrs. Assn., who also declares that the industry will have to operate at record levels for several years to catch up with accumulated demands. In 1937 about 891,000 units were produced. From estimated output of 21,600 civilian trucks in July, this pace should be achieved by the industry as a whole by Christmas, with variations among individual manufacturers according to reconversion problems. Most producers have been building large numbers of military vehicles and a few commercial units throughout the war, and most production lines are intact. The main, and most perplexing problem, as with passenger cars, is availability of raw material.

Production plans still are indefinite for the Crosley automobile even though a now eliminated quota of 8000 units was initially assigned for 1945 production. When production does begin it will be by Crosley Motors which remains in control of the Powel Crosley, Jr., interests following sale of other activities of the Crosley Corp. Crosley Motors will take over the Spring Grove Ave. plant in Cincinnati, engaged in Navy engine production during the war, for production of the automobile engines. Anticipated production rates higher than the Navy schedule will involve augmented tooling at the plant, and the purchasing department now is occupied with this phase. Reports from Indianapolis last week indicated that Crosley had inspected the $5,000,000 Curtiss-Wright propeller plant there as a possible assembly plant. Prewar the final assembly plant was at Richmond, Ind.

Employment still is on the downgrade in Detroit. Both the War Manpower Commission and the United Auto Workers (CIO) estimate that the industry companies have laid off 160,000, with over 200,000 workers idle for all Detroit industry. This, according to UAW estimates, is in addition to 100,000 workers dropped since the wartime peak. UAW president R. J. Thomas chided employers over the layoffs, said that, "too many people have forgotten that the end product of impoverishment to workers is economic crisis in the whole country." As a matter of fact, decreased incomes were forcing the union to do some laying-off on its own account. Just before V-J Day the union cut 40 international representatives from its field staff, with five others slated to go soon, and more later. Like the manufacturers, the UAW found that the end of the war meant less income as laid-off members stopped paying dues. Thus a $350,000 annual saving, even though it added to unemployment among labor representatives, looked sensible. The UAW, incidentally, hopes to hold an international convention before the end of the year.

CONTRARY to predictions that a wave of strikes would engulf Detroit immediately after the war, and despite rescinding by the UAW by its wartime no-strike pledge, the Detroit strike thermometer registered just about normal last week. Ford tractor and automobile production was hampered by a strike of about 4500 workers at the Kelsey-Hayes Wheel Co., which supplies Ford with wheels, brakedrums and tractor parts. About 1500 Ford assemblers were idle. Offsetting this development, about 1500

Ford assemblers were idle. Offsetting this development, about 1500 Chrysler employes went back to work following the end of the Detroit Steel Products strike. Dodge truck employes returned to work last Thursday and Dodge-Main plant workers started this Tuesday. About 600 were out at Continental Motors Corp.; 250 at Woodall Industries, 900 Bundy Tubing, 500 Murray Corp., and 100 at Hercules Forge.

Detroit's part in automotive ordnance production during the war is summarized in totals released by the Office of the Chief of Ordnance-Detroit. Production from Sept. 1, 1942, to Sept. 1, 1945, totaled 78,373 tanks; 43,689 self-propelled weapons; 113,630 miscellaneous combat vehicles; 1,032,886 light-medium trucks; 634,353 light-heavy trucks; 130,539 heavy trucks; and 1,016,647 other vehicles and miscellaneous items, for a grand total of 3,050,117 units. This amounted to 45.7 pct of all the ordnance procurement and 26.9 pct of all army service force procurement. Chrysler has completed arrangements to turn back to the army the Chrysler tank arsenal which accounted for the bulk of Chrysler's production of 25,000 tanks in models ranging from the 28-ton General Grant, 30-ton General Shermans and 45-ton General Pershings, to secret tanks not yet announced weighing more than 60 tons.

General Motors will build a plant on a 175-acre site near Elyria, Ohio, to produce hub caps, bumper guards, grilles and similar products. The plant near Syracuse, N. Y., now operated by Brown-Lipe-Chapin division for production of these parts will be turned over to Harrison Radiator division, which will produce car heaters, defrosters and similar products.

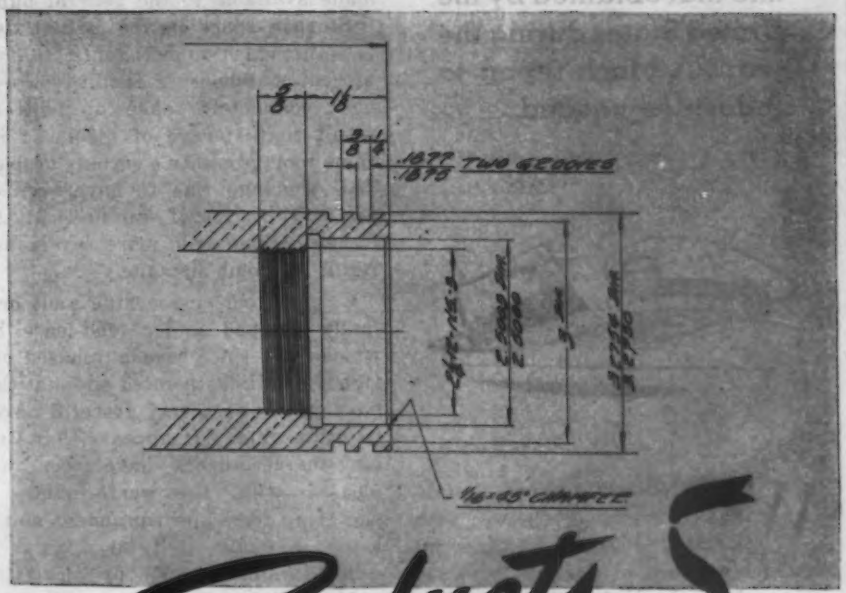
Preference Ratings To End on Sept. 30

Washington

• • • Small manufacturers operating under Priorities Regulation No. 27 have been notified by WPB that despite earlier regulations they would not be permitted to use their AA-4 rating and Z-3 allotment symbol after Sept. 30.

Manufacturers operating under PR 27, who need priorities assistance after Sept. 30 may apply under the terms of PR 28, provided they can meet the conditions.

Better Gages



MAKE POSSIBLE

Better Products

EVERY advancement made in precision manufacturing has followed or coincided with an improvement in gaging methods. Extremely close tolerances have been made possible in production only because gages were produced to provide the required inspection accuracy.

Lincoln Park's development and use of Carboloy for gages has made it possible for hundreds of concerns to produce parts to much closer limits than would ever have been considered practical a few years ago. In Lincoln Park Carboloy gages, wear allowance is not necessary. At no time are they "over-size" but are accurate to required limits from the first inspection. They provide the precision which is so essential when a slight variance from accurate gage limits could mean the rejection of many parts that actually should be accepted.

The trend toward even greater precision in manufacturing operations will definitely continue into the post-war years. If you are to remain competitive in your markets, you too, will be producing better products to new standards of accuracy. And, as always, better products will call for better gages such as are now being made—and will continue to be made—at Lincoln Park.

LINCOLN PARK INDUSTRIES, INC.

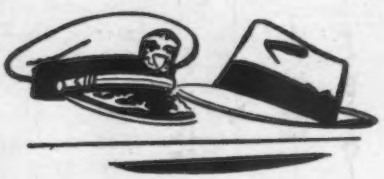
Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

1729 FERRIS AVENUE • LINCOLN PARK 25, MICHIGAN

Washington . . . .

L. W. MOFFETT

• Great Britain steel capacity increase nothing like that obtained by the United States during the war . . . Much repair to industries needed.



WASHINGTON—Great Britain has come through the war with nothing like the sizable increase in steel production capacity attained by the United States. This is due in great part to bomb damage sustained by British mills which has practically offset whatever might have been accomplished along those lines, Saville Hicks, British production specialist, told the IRON AGE recently. Mr. Hicks who served during the war as Regional Controller in Northern Ireland for the Ministries of Production, Supply, and Aircraft Production, is now in the United States observing reconversion activities.

In view of damage sustained by Britain's industries, including steel, it will be necessary to repair, rebuild and expand present manufacturing facilities if reported plans to increase exports—possibly by 50 pct over prewar levels—are to be carried out with any degree of success. British imports are expected to remain at relatively low levels for some time in order to achieve a favorable balance of trade.

Government owned machine tools are disposed of after they have been declared "redundant" — the British equivalent of "surplus"—in a manner similar to our own procedure. Those no longer needed by the government are procurable at the option of the owner or lessee of the plant in which they are installed or to the sublessee if the party having first priority does not choose to exercise the option. In the event that the machines go unsold, they are removed from the premises and transferred to the central clearing house where they are made available to the general public.

Storage space in the British Isles is practicaly non-existent; that is, present warehousing facilities are almost completely taken up with the result that storage of displaced machine tools presents a serious problem. This shortage was to have been expected by reason of war necessity but it has become even more severe as a result of bomb damage.

Commenting on machine tools originally shipped under lend-lease but which have since been purchased outright, Mr. Hicks pointed out that they have served as a very forceful advertising medium. It appears that British manufacturers have been well pleased with the performance of American tools and equipment and in many instances will be anxious to secure replacements for peacetime production.

The British so far have no equivalent of the Surplus Property Board in the form of a separate, policy making body. Actually, disposition of "redundant" items is taken care of by the Ministry of Supply which is a procurement agency somewhat similar to the Procurement Branch of our Treasury Department.

"Redundant" goods usable for civilian purposes are disposed of through trade channels by the Ministry of Supply working through 30-odd committees which have been established to process items as they are declared "redundant."

There are a number of "redundant" war factories to be disposed of, Mr. Hicks said. Many were built during the early days of the war when the need was very great at a considerable expense over that which would ordinarily be required for plant construction. This is similar to our own situation which saw round-the-clock efforts to ready plants for war production with little emphasis placed on the costs entailed. In view of this, the British authorities have arbitrarily decided to put a 1939 valuation on these plants for sales purposes. There

VETERAN REPRESENTATIVE: *Junior J. Spurrier, Congressional Medal of Honor winner, is a new representative for Veterans of Foreign Wars. He says vets will get their jobs or else.*

FULL EMPLOYMENT: *Secretary of Commerce Henry Wallace took the witness chair before the Senate Banking and Currency Committee last week, plumping for the full employment bill.*

CLEAN CUTS AT HIGH SURFACE SPEEDS

SUNICUT...

Improves Turning, Boring, and Threading Operations On Brass

The right cutting oil for the right operation can make the difference between rejects or parts which meet the most exacting requirements. This was amply proved by a manufacturer of precision parts when he switched from a competitive oil to Sunicut No. 973 for turning, boring, and threading on the following operation:

Type of Machine: National Acme Gridley Automatic Screw Machine; 2⅝" capacity; Model R.B.; Six Spindles.

Material Machined: Commercial Rod Brass
Operation: ..... Machining Booster Body for Fuse
Speed: ..... 400 Surface-Feet per Minute
Feed: ..... .003"
Lubricant: ..... Sunicut No. 973

With the competitive oil, it was difficult to maintain accuracy of finished parts. Threads were of poor quality, due to chatter-marks. Rejects ran high.

When a Sun Oil Company Engineer was called in, he recommended a change to Sunicut No. 973. Production increased. Accuracy was held to closer tolerances. Chatter-marks were eliminated. Better threads were obtained. Rejects were greatly reduced.

This is just one case taken from the hundreds in Sun's product-performance files. For factual proof of what Sunicut, the clear, transparent, non-emulsifiable cutting oil can do for you, test it in your own plant. Sun Products and Sun Engineering Service are yours to use to improve production. Write . . .

SUN OIL COMPANY · ***Philadelphia 3, Pa.***
Sponsors of the Sunoco News Voice of the Air — Lowell Thomas

SUNOCO **SUN INDUSTRIAL PRODUCTS**

OILS FOR AMERICAN INDUSTRY

are, of course, slight variations in the pricing formula.

"Redundant" war plants in Britain are not necessarily sold to the highest bidder. Certain other factors are considered before the successful purchaser is chosen. These include the financial responsibility of the prospective buyer and whether the sale, if negotiated, would be for the betterment of the community. In most cases there are purchase options which may be exercised by the lessee or operator of the plant.

Reconversion of many British war plants will involve extensive alterations. To afford protection to individual factory segments from the explosive force of bombs, special partitions were constructed between machine tool units. These will have to be removed in addition to other wartime impediments such as blackout equipment.

Decentralization of manufacturing plants which was initially opposed by some industrialists has been met with practically unanimous approval. Plant owners, Mr. Hicks said, now realize the benefits to be achieved by establishing factories away from crowded metropolitan centers. Housing, of course, continues to be the big problem.

The unemployment problem in Great Britain may not prove to be quite so severe as in the United States, according to Mr. Hicks. This is attributed to the labor needs for the tremendous rebuilding program, both industrial and residential, which will be necessary over the next few years. It has been estimated that upwards of 24 months will be required to make primary repairs in damaged residential areas.

There will be a problem, however of removing workers from war production centers that are no longer busy to areas providing peacetime employment. This, Mr. Hicks explained, can be attributed to the housing shortages and a partial breakdown of the long overtaxed transport system. Workers who have been employed in modern war factories at relatively higher wages are not expected to be anxious to resume employment in the textile industry and iron foundries. This problem, of course, is not unknown in this country.

The economy in Great Britain will undoubtedly continue to be controlled much longer than in the United States. Stringent rationing is still in effect with practically no letup of controls on consumer goods, prices and gasoline. A striking contrast of the immediate consumer market for cooking utensils in Great Britain, when compared with this country, was made by Mr. Hicks, who pointed out that under present rationing each family is limited to a single kettle every 2½ yrs.

The British government meanwhile is moving right along in its reconversion program. It has been estimated that around 1,000,000 workers will be temporarily disemployed in the transition period. It is primarily a problem of diverting those displaced workers into those lines of endeavor where their services can best be utilized. As previously pointed out, the building trades will probably be understaffed for some time to come.

* * *

Envisaging United States exports to China at an annual rate of approximately $250,000,000 for the next six years, Charles K. Moser, Chief, Far Eastern Unit, Department of Commerce, recently said, "Postwar China undoubtedly offers a potential market for the types of merchandise which the United States is nominally so well equipped to supply."

The estimate of the value of imports, Mr. Moser pointed out, can be reached, or even increased, if prevailing conditions within the Republic are such as to encourage large-scale investment of foreign capital.

Heavy and light machinery, railroad equipment, tele-communications equipment, roadbuilding and farm machinery, automobiles, buses, trucks, airplanes, chemicals, pharmaceuticals, foodstuffs, durable consumer goods, leather belting, fuels and lubricating oils are among the types of merchandise which China will want to purchase from the United States.

The time is not now opportune, however, for United States exporters to plan immediate participation in this trade on an enlarged scale because of the time required for evacuation of the Japanese, the need for China to readjust its economy after a prolonged war, and United States domestic requirements, Mr. Moser said.

Official trade statistics show that in 1936, the last year of relatively normal trade before being attacked by Japan, exports of Chinese products expressed in United States currency were valued at $211,000,000 while general imports were valued at $281,000,000.

The United States, Japan, Germany, United Kingdom, French Indo-China and Netherlands Indies were the chief sources of imports in the order named. The United States, Hong Kong, Japan, United Kingdom, Germany and France were the principal foreign markets for Chinese products.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

M-M-QUITE A IDEE! YOU JUST HANG TH' MIKES OVER TH' JOB ON A SPRING AND YOU DON'T HAVE TO KEEP LAYIN' 'EM DOWN AN' PICKIN' 'EM UP--M-M-UH!
NOW WAIT! I DIDN'T INVENT THAT IDEAR! A GUY TOLD ME!
NOW THERE IS A GUY WHO IS REALLY HONEST--HE DON'T HESITATE A SECOND IN GIVIN' CREDIT WHERE CREDIT IS DUE!
NO, HE JUST AIN'T SURE IF IT WILL BE CONSIDERED A FOOL'S IDEA OR A LAZY MAN'S GADGET --YOU CAN'T THROW OUT YOUR CHEST WHEN YOU'RE DUCKIN'!
J.R.WILLIAMS
9-7
THE DODGER
COPR. 1945 BY NEA SERVICE, INC. T. M. REG. U. S. PAT. OFF.

What kind of monument to the Unknown Soldier's son?

Here stands one of the most hallowed monuments in the world . . . and one of the most tragic.

For this American soldier died that the world might be safe for his son.

And his son was killed.

We propose a different kind of monument to this second generation unknown.

America now is more powerful than all the rest of the world.

More powerful in thought . . . A single American magazine today, printed in 11 languages, outsells any other publication in 53 countries of the world. People are eager for American ideas.

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West Coast . . .

OSGOOD MURDOCK

• Governors exerting pressure for Western Deputy OWMR Director Resident . . . Unemployment claims reach 38,107 in California . . . Steps for taking over government - owned aluminum plants outlined.

SAN FRANCISCO—Even though John W. Snyder, Director of the Office of War Mobilization and Reconversion in Washington gently but firmly turned down the initial request, concerted pressure is still being exerted by governors of 11 western States for the appointment of a deputy OMR director resident in the Far West with power to act in connection with major conversion and adjustment problems.

"Full knowledge of particular conditions and needs in different communities is essential for the effective administration of federal policy and program during the readjustment period," declares Governor Earl Warren of California. And he has personally taken the lead in a concerted and consistent drive for this appointment and the establishment of this new office. Such a chief executive resident on the West Coast with direct channel to Washington, would have authority over decisions on relaxation of OPA rationing and price controls, disposal of surplus facilities, equipment and materials, leasing or disposal of war plants and the channeling and screening of authoritative information and recommendations to the various Washington federal offices and administrators concerned, where the separate interests of the economic area west of the Rocky Mountains are concerned.

"Everything I knew has been canceled or rescinded," admitted a regional WPB executive on return from a week's vacation immediately following V-J Day. And his state of mind is very generally reflected among the other local government agencies and among industrial executives. No tired football player could have greater difficulty reversing their field after an unexpected fumble than Far Western executives and responsible administrators in the present adjustment following V-J Day so unexpectedly. Ships lie idle at piers. Navy and Army officers pace hotels. Freight cars await on sidings and former war production lines stand still exactly as they were three weeks ago, all awaiting orders from harried, distant and often misunderstanding officials in far-away Washington.

Despite all sudden terminations and cancellations, there are still jobs in the Far West for all who want to work and whose blood is not too rich. More than 24,000 persons are needed to fill peacetime jobs in the San Francisco Bay area, according to realistic Sam Kagel, State Manpower Director in northern California. In spite of 83,000 layoffs reported since the Japanese surrender in southern California, work openings have remained steady for 50,000. Even though 15,000 war workers were placed last week by the War Manpower Commission and USES there.

A total of 38,107 unemployment insurance claims were filed in California during the week Aug. 17 to 23 as compared with 3904 claims for the previous week. The State Employment Stabilization Commission reports from the state capitol. Almost two-thirds of the claims were from southern California.

A "work-pile" tabulation which totaled $170 million worth of work to be done in the city of San Francisco has been compiled by the local Chamber of Commerce. About one-half is for remodelling and repair and the other half for new construction.

At midyear the number of employees engaged in new construction in Maritime Commission yards on the West Coast was approximately 129,000 compared with 258,000 six months earlier and 329,000 at the peak in September, 1943. According to a current authoritative summary of the Federal Reserve Bank. The delivery of vessels was well maintained, however. For an aggregate light weight tonnage of about 1,437,000 tons were turned over to the commission during the first half of the current year compared with 1,456,000 tons in the last half of 1944.

ALUMINUM CASTING: *Housewives will soon have ample stocks of new kitchenwares available. This plant which formerly was producing aircraft castings in Los Angeles, is now in production.*

Figures recently released by the War Manpower Commission reflect the great expansion of Navy repair facilities on the Pacific Coast during the past five years. In the first quarter of 1941, 25,600 workers were employed and at the beginning of 1942 during the first months of war 43,200 was the personnel. This labor force has now grown to over 100,000, on four major yards instead of two prewar.

In addition to the Navy establishments, privately operated drydocks and repair yards on San Francisco Bay, Puget Sound and Los Angeles Harbor have been converted to specialized Naval construction and re-

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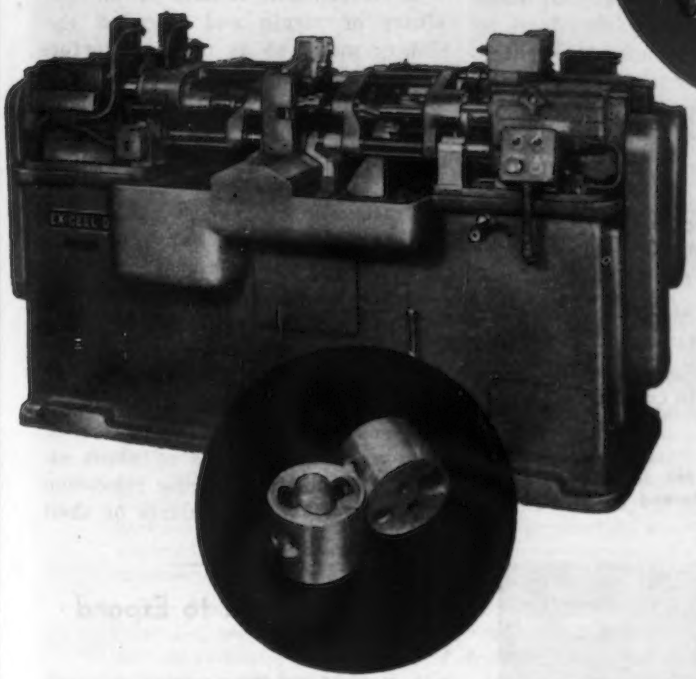

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To left: Ex-Cell-O Small Style No. 21 Hydraulic Units being used for accurately drilling holes in oil pump bodies. This small unit makes for less floor space. It has all the features of the larger units and can be operated individually or in combination.

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pair. Floating drydocks have recently been installed at a number of such plants. Two at an Oakland yard, one at Portland, one at Seattle and another is reported about to be installed at Wilmington on Los Angeles Harbor. All these are, of course, in addition to extensive advance bases which have been installed at Hawaii and in the Far Pacific, all principally supplied from the West Coast, both as to materials, manpower and facilities.

One of the factors contributing to the difficulty of manning Pacific Coast Navy Yards has been the somewhat lower scale of pay prevailing in the government establishment as compared with privately operated yards. There is ample evidence that the marked increase in rates of pay which have occurred in private shipyards since 1940 were not entirely matched by corresponding wages.

Increases in the Navy Yards and as a consequence basic hourly rates of pay for comparable occupation are now somewhat lower in the Navy Yards than in private yards. This has been and is an obstacle to the recruitment of skilled workmen in the Naval establishments.

When badly needed warships were clogging the repair yards late this spring and the situation on combat vessels had reached a critical stage with shortages of as high as 20,000 ship repair workers for the Pacific Coast area, three-quarters of them in the San Francisco district alone, National Selective Service on May 23 took the unprecedented step of granting blanket draft deferments to nine categories of skilled workmen employed in Pacific Coast ship repair yards. At the same time the Production Urgency Committee accorded a No. 1 urgency priority rating to West Coast ship repair yards.

At the end of June not less than 60 shipyards were engaged in ship repair with approximately 175,000 workmen reported in repair work. This represented about two-fifths of all shipyard employment at that date. This constantly growing labor force is believed to be in the neighborhood of 200,000 at the present time and there has been no letup in their employment or in the demand for skilled ship repair workers. More than half the total number of repair workers are still accounted for by the four larger Navy Yards. It is generally expected that this labor force and the industrial activity associated with ship repair and conversion will continue firm and active at the present peak for many months to come.

Development of a completely integrated aluminum industry in the Pacific Northwest, based on the region's existing reduction capacity, would provide employment for 25,000 workers, or almost four times as many as at present, according to Paul J. Raver, administrator of the Bonneville Power Administration before the Senate Mead Committee recently. Mr. Raver suggests the following five immediate steps by government agencies to assist new operators in taking over the government-owned aluminum plants:

1. Government stock-piling of aluminum ingots as a national defense measure to prevent immediate shutdown of major capacity.

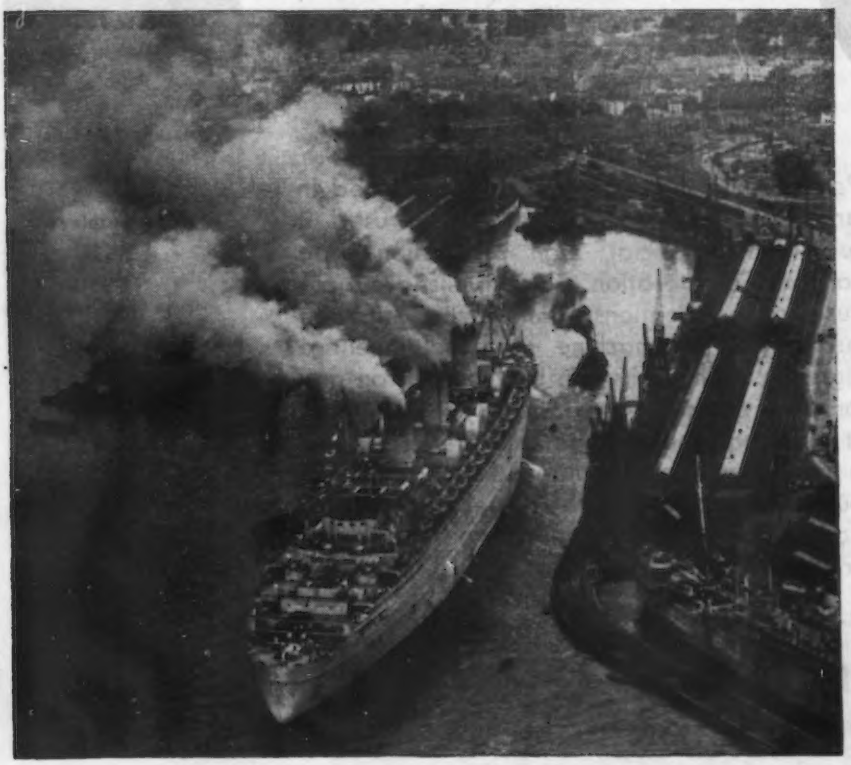
2. Government control of all surpluses of virgin and so-called secondary metal so as not to interfere with an orderly change of price levels.

3. Government to provide new operators with access to high grade imported bauxite.

4. Government agencies to assist private enterprise to "appraise both export and domestic use of light metals," including the freight rates basic to aluminum marketing problem from the Pacific Northwest.

5. Government to provide engineering assistance in appraising production costs, grant flexible terms of lease and assume costs of plant alterations even to financing relocation of improperly located plants or their equipment.

REOPENS SOUTHAMPTON: *Veteran of troopcarrying on the seven seas, the Queen Mary officially opened the British port as she returned priority passengers from America.*



Allegheny-Ludlum to Expand

Pittsburgh

• • • A $5,000,000 postwar research and production expansion program has been planned by the Allegheny-Ludlum Steel Corp., according to Hiland G. Batcheller, president. At the company's main plant at Brackenridge, Pa., a research laboratory with a related experimental and pilot plant with all auxiliary equipment will be built. This addition is planned for the intensification of studies on structure, melting, processing, and further development work on high alloy steels.

At the West Leechburg, Pa., plant of the company, it is planned that a cold rolling mill of the latest design be built for rolling stainless and silicon strip steels. This mill will add materially to the finishing capacity of the plant and will bring new precision and uniformity of quality in the production of the special strip steels made there. Work will get underway rapidly.

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PERSONALS

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• **Charles B. White,** Chas. B. White Co., Houston, Tex., has been elected a director of Southern Aircraft Corp., Garland, Tex.

• **Gunnar Sinding-Larsen** has been made vice-president of Pittsburgh Piping & Equipment Co. **D. M. Weir, Jr.,** has been appointed general manager of sales for the company.

• **Frederic S. Cross** has been appointed chief resident legal counsel of the Glenn L. Martin Co., Baltimore, Md.

• **L. I. Barker** has been appointed assistant district sales manager of the Cleveland sales office of Republic Steel Corp. He had been assistant manager of sales of Republic's Union Drawn Div. at Massillon, Ohio.

• **Paul F. Kohlhaas** has been appointed to fill the newly-created position of vice-president in charge of engineering of Columbia Steel Co., San Francisco. Mr. Kohlhaas since 1941 has been chief engineer of Columbia Steel, a subsidiary of U. S. Steel Corp. His earliest training started with the Perin Engineering Co., New York. He assisted in the building of iron and steel plants in England, China, Japan, Manchuria, India and many parts of the European continent.

PAUL F. KOHLHAAS, vice-president in charge of engineering, Columbia Steel Co.

CARL A. ILGENFRITZ, vice-president in charge of purchases, and R. L. VAN CLEVE, general purchasing agent, Carnegie-Illinois Steel Co.

• **Carl A. Ilgenfritz** has been appointed vice-president in charge of purchases, a newly established post, of Carnegie-Illinois Steel Corp. **R. L. Van Cleve** has been named general purchasing agent. Their offices will be located in Pittsburgh. Most recently Mr. Ilgenfritz has been manager of purchases and raw materials, Republic Steel Corp. and previously had been associated with Youngstown Sheet & Tube Co., Brier Hill Steel Co. and the Stroh-Ilgenfritz Co. Mr. Van Cleve, who joined U. S. Steel in 1914, has been assistant purchasing agent Pittsburgh district, since 1935. **Frank J. Rief,** general purchasing agent, Carnegie-Illinois, will retire after an association of more than 33 yr with the firm.

• **Everett L. Stewart** has been made production supervisor of the General Electric Co., Pittsfield, Mass., Plastic Div., and **William F. Hartigan** production supervisor of the Pittsfield Molded Products works to succeed Mr. Stewart.

• **Emil C. Ostlund,** assistant chief industrial engineer, has been appointed chief industrial engineer of American Steel & Wire Co., subsidiary of U. S. Steel Corp., succeeding Cecil W. Guyatt. **Harry M. Francis** has returned to American Steel & Wire after resigning his post as deputy director of the War Production Board's Steel Div.

• **Andrew G. Haley,** founder and president, Aerojet Engineering Corp., Pasadena, Calif., for the past three years, has resigned the office of president and director to resume the practice of law.

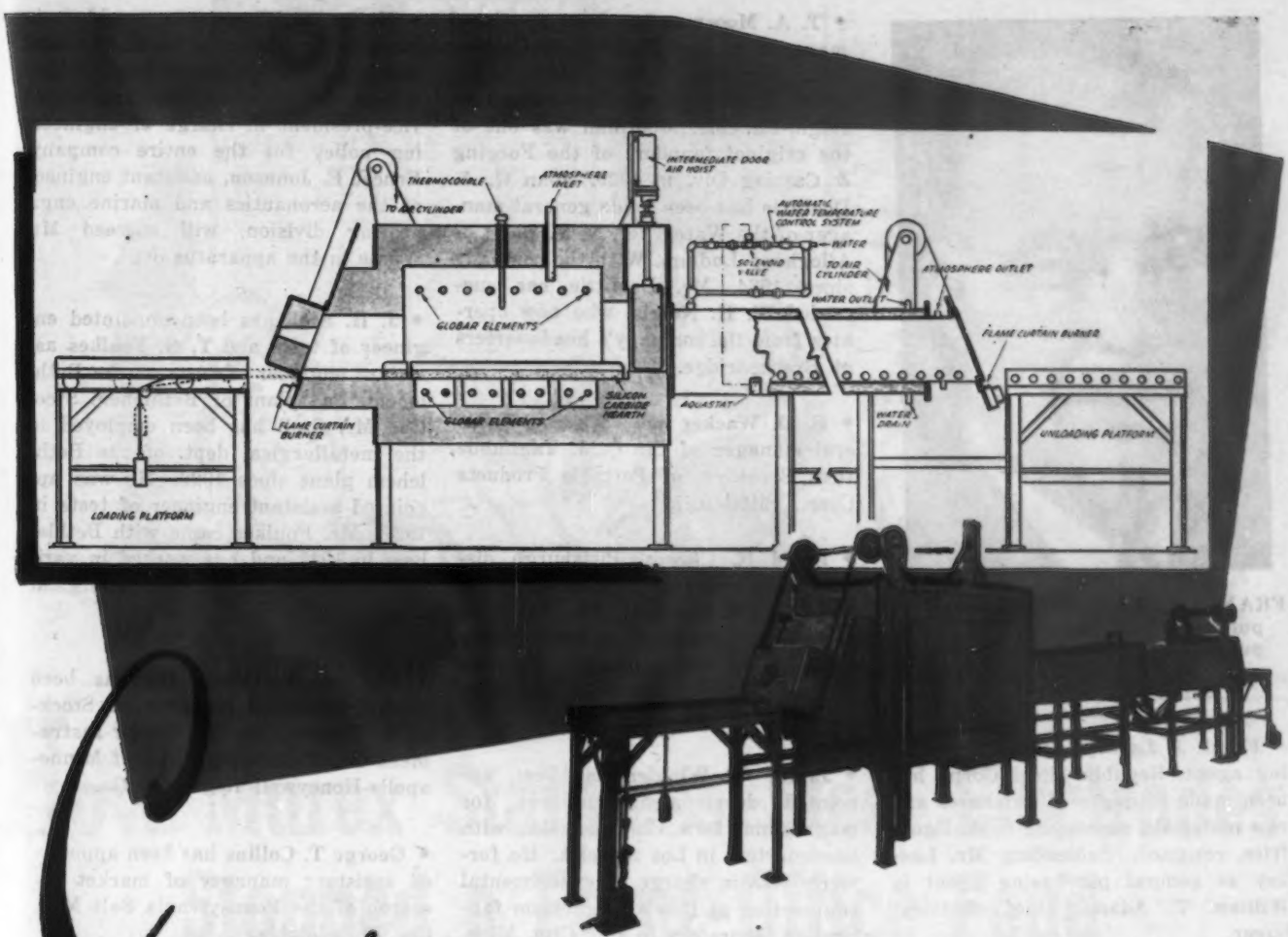
• **Heber V. Lauer** has been appointed field supervisor, raw materials, Fuel & Power Div., Chicago district, Carnegie-Illinois Steel Corp. He has been assistant superintendent of coke plant and blast furnaces at the company's Gary Works. **Jack H. Eisaman** has been named superintendent, number two electric furnace shop, South Chicago Works of Carnegie-Illinois.

• **Arnold H. Smith** has been appointed director of the foreign dept. of Monsanto Chemical Co., succeeding **Herbert M. Hodges,** who will retire Oct. 1. Mr. Hodges will retain the title of overseas director until completion of a special mission to China, India and South Africa. **John E. Gurvin** has been appointed vice-president of Merritt Engineering & Sales Co., a Monsanto subsidiary. **H. J. Heffernan** has been appointed assistant general manager of sales of the company's Merrimas Div., Boston, Mass., succeeding the late Horace Burrough III. Mr. Heffernan is succeeded as branch manager of the division's New York office by **W. E. Drown. J. J. McCarthy** has been appointed manager of textile sales development in the Merrimac Div., sales dpeartment.

• **Richard J. Beck** has been appointed western sales manager, Braeburn Alloy Steel Corp., Chicago.

• **A. C. Monteith** has been named assistant manager of headquarters engineering of Westinghouse Electric Corp., Pittsburgh.

• **B. H. Huffman** has been made supervisor of Pittsburgh district sales, Diamond Alkali Co., Pittsburgh.



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FRANK J. LASKEY, manager of purchases and raw materials, Republic Steel Corp.

• **Frank J. Laskey,** general purchasing agent, Republic Steel Corp., has been made manager of purchases and raw materials, succeeding C. A. Ilgenfritz, resigned. Succeeding Mr. Laskey as general purchasing agent is **William T. Adams,** chief electrical buyer.

• **Robert W. Burgess** has been made plant manager in charge of engineering and tool production, Service Machine Co., Elizabeth, N. J.

• **William E. Zipp** has been appointed vice-president in charge of sales for the Manufacturing Div. of Ceco Steel Products Corp. He will have headquarters in the division's plant in Cicero, Ill.

• **W. Guy Bagley** has been appointed assistant sales manager of Woodward Iron Co., Birmingham, Ala. He was formerly associated with Republic Steel Corp. in their Birmingham office.

• **William R. Ellis** and **Mahlon G. Milliken** have been elected vice-presidents of the Hercules Powder Co., Wilmington, Del. Mr. Ellis has been general manager of the explosives dept. and Mr. Milliken, general manager of the cellulose products dept. **Philip B. Stull,** now a vice-president, Mr. Ellis and Mr. Milliken have been elected members of the executive committee. **John J. B. Fulenwider** will succeed Mr. Milliken as general manager of the cellulose products dept. and **J. B. Johnson** will succeed Mr. Ellis as general manager of the explosives dept.

• **T. A. Moorman** has been appointed manager of the Forging & Casting Div., Ferndale, Detroit, Mich., Allegheny Ludlum Steel Corp., Brackenridge, Pa. Mr. Moorman was one of the original founders of the Forging & Casting Div. in 1929. **John Q. A. Doolittle** has been made general manager of the Watervliet, N. Y., plant of Allegheny Ludlum. With the company since 1934, Mr. Doolittle has succeeded **W. H. Norris,** who now operates from the company's headquarters at Brackenridge.

• **E. D. Wacker** has been made general manager of the C. J. Tagliabue Div., Brooklyn, of Portable Products Corp., Pittsburgh.

• **Lloyd R. Clowes,** Pittsburgh district sales manager of Firth-Sterling Steel Co., McKeesport, Pa., has been appointed assistant general sales manager of the company. He was previously associated with the War Production Board's Tool Div.

• **James V. Winkler** has been appointed development engineer for magnesium, Dow Chemical Co., with headquarters in Los Angeles. He formerly was in charge of experimental engineering at Dow's magnesium fabrication laboratory in Bay City, Mich.

• **Harry A. Winne,** vice-president in charge of engineering for the General Electric Co.'s apparatus dept. Schenectady, N. Y., has been appointed vice-president in charge of engineering policy for the entire company. **Ernest E. Johnson,** assistant engineer of the aeronautics and marine engineering division, will succeed Mr. Winne in the apparatus dept.

• **J. H. Stoll** has been appointed engineer of tests and **T. G. Foulkes** assistant engineer of tests at the Bethlehem, Pa., plant of Bethlehem Steel Co. Mr. Stoll has been employed in the metallurgical dept. of the Bethlehem plant since 1922. He was appointed assistant engineer of tests in 1927. Mr. Foulkes came with Bethlehem in 1922 and has worked in various capacities in the metallurgical dept.

• **Sigfried A. Olson, Jr.,** has been named industrial manager at Stockholm, Sweden, for the Brown Instrument Co., Philadelphia Div. of Minneapolis-Honeywell Regulator Co.

• **George T. Collins** has been appointed assistant manager of market research of the Pennsylvania Salt Mfg. Co., Philadelphia.

OBITUARY...

• **Harvey Frame,** 69, secretary and director of the Waukesha Motor Co. and the Heinn Motor Parts Corp., Waukesha, Wis., died recently.

• **John E. Miller,** 40, general superintendent of the Lackawanna strip mill of the Bethlehem Steel Co., died recently. He became associated with the Lackawanna works nine years ago as chief metallurgist of the strip mill and was promoted to the superintendency eight months ago.

• **John W. Cowper, Jr.,** executive vice-president of the John W. Cowper Co., Inc., general contractors, died recently. He was 36.

• **Harry W. Bails,** purchasing agent for 33 years of the Barber-Colman Co., Rockford, Ill., died recently.

• **Henry Disston,** 71, chairman of the board of Henry Disston & Sons, Inc., Philadelphia, died recently.

• **Ben Froemming,** 43, former public works contractor, whose shipyard recently won the speed king prize for construction competition from Henry Kaiser, died suddenly at his home in Milwaukee recently.

• **John T. Seamen,** 63, assistant to the vice-president of Columbia Steel & Shafting Co., Carnegie, Pa., died Aug. 27. He had been associated with the company for 31 years and prior to his appointment as assistant to the vice-president he was district sales manager of the company's Philadelphia office.

• **Adolphus M. Dudley** retired engineer of Westinghouse Electric Corp., died suddenly at his home in Oakmont, Pa., recently. He was widely known for his contributions to professional engineering, engineering education and technical writings.

• **William B. du Pont,** manager of the Industrial Div., National Radiator Co., Johnstown, Pa., died recently, after a short illness. He was 31 years old.

• **Harry M. Swigart,** 53, president of Oilgear Co., Milwaukee, died recently. He became president of the firm in 1928.

How Murex Stainless Steel Electrodes Stopped a Front-Office Feud

I saw we were in for a grim front-office hammer fight, complete with bashed-in tin crowns and spattered executive blood. For weeks Old Flagg, our Purchasing Agent, had been going over our purchase orders, trying to trip up Charley Pratt, his assistant and my boss. Old Flagg's not mean, really: it's just his idea of efficiency. Only now it had stopped being tiresome and become maddening, especially as he at last had Charley out on a limb.

"Murex does so make A.C. Stainless Steel electrodes!" Charley practically yelled, right in the old mule's face. "Isn't Murex one of the leading manufacturers of arc-welding rods? Haven't we bought their stuff for years? Of course they make Stainless Steel electrodes for use on A.C. and D.C. both! And darned good ones, I assume."

"See?" Old Flagg barked, triumphantly. "You don't know if they make them or not: you assume. Now when I was a young man, just starting up the ladder of success..."

I'm only a secretary, but that's where I stepped in. I've heard, nine million times, the tale of Old Flagg's thrilling Rise To The Top. Besides, if the feud went much further, I'd have the bother of breaking in a new boss.

I therefore said sweetly, "Gentlemen, I do not mean to rush in where even Joe Louis would fear to tread. But why don't we walk across to the shop and ask Tom Belt, the arc-welding super?"

We walked across and asked Tom. He didn't like to say too much, Old Flagg being present. Instead, he just pointed at the new Murex Wall Chart tacked up over his desk. It listed Murex's thirty-odd electrodes, divided by class: for mild steel, low-alloy steel, hard surfacing—and Stainless Steel both A.C. and D.C.*

I thought Old Flagg would hum and haw, and keep beating on Charley on general principles. Instead, as a peace offering, he treated Charley and me to a swell lunch up in the very plush senior executive dining room. You may not get a free lunch out of it, or stop any front-office wars, but if you have anything to do with arc-welding, you should have a copy of the big Murex Wall Chart handy. A postcard will bring you one.

*The Murex Stainless Steel electrodes the above excitement's about are 18/8, 18/8Cb, 18/8 Mo, Type 347, 19/9 Mn, 25/20 and Type 310. 18/8 Mo, Type 347 and Type 310 operate either on A.C. or DC., and the others on D.C.

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MUREX Electrodes

Dear Editor:

SILVER BRAZING

Kindly send us a reprint of the article, "Material Cleaning Before Silver Brazing," by John Gauthier, which appeared in the Mar. 22 issue.

W. J. KUPFRIAN,
Vice-President, Engineering
Elliott Mfg. Co.,
Binghamton, N. Y.

● Reprints have not been made, but we are mailing tear sheets.—Ed.

IRON POWDER SIZE

Sir:

Would you send us eight reprints of the article, "Particle Size Analysis of Iron Powders," from the May 17 issue?

ALAN S. MARGOLIES,
Research Fellow
Stevens Institute of Technology,
Hoboken, N. J.

● We did not reprint this article but are sending two tear sheets.—Ed.

WELDING ROD SPECS

Sir:

I would like to take vigorous exception to the letter published on the Dear Editor page, July 12 issue, in which J. F. Lincoln sharply criticized the Filler Metal Committee of the American Welding Society and the recent fruits of their labor, the Tentative Specifications for Iron & Steel Arc Welding Electrodes A233-45T.

First, Mr. Lincoln makes a sweeping generalization that the specification is too ambiguous and contradictory to be of any value. If there are, in fact, any ambiguities or contradictions in the specification I am sure that they would be clarified immediately upon being brought to the committee's attention.

Next, Mr. Lincoln complains that the tests are too complicated, too many and too costly to be useful in checking production. A careful analysis will show that the tests themselves are not complicated; only the descriptions are, and necessarily so. Although specification tests that could be used to check production might be desirable, the tests have not been designed to this end. They are used to define and test an electrode's capabilities; and a manufacturer is obviously free to make as many or as few tests as he pleases, of whatever nature he pleases as long as he can say with all the assurance his conscience and the management's pocketbook demands, that the tests are correlated, and the electrodes will surely pass the consumer's specifications, which are usually the AWS specifications, and will not "bounce."

Another "horrible example" cited in by Mr. Lincoln, is the fact that tests are not made on the ⅛ in. and smaller sizes; and, therefore, only one of the larger sizes needs to be tested. Personally, I think that tests *ought* to be made on *each* size, including the ⅛ in. and smaller, since manufacturing practices differ for each size, and it is not simply a matter of proportioning the volume of covering to the diameter of the core wire. However, producers have given themselves a break by convincing (?) the consumers that the small sizes will be O.K. if the larger sizes are O.K.

The next item was the new prohibition against dual classification of electrodes. Does Mr. Lincoln mean to say that Fleetweld 35 (E6011) is the same electrode as Fleetweld 5 (E6010) merely because they will both operate with direct current reverse polarity and give the same weld metal? Fleetweld 35 will also meet the physical requirements of E6012 but does Mr. Lincoln fill a valued customer's order for E6012 with Fleetweld 35?

Do not the various type classifications imply other things beside physical properties—such as cellulosic coverings for E6010, utile coverings for E6012, etc.; and do they not imply certain usability characteristics—such as deep or shallow penetration, slow or fast burn-off rates, etc.?

No electrode can combine all these opposites in one, so how can one electrode be two different types. But if I'm wrong, why does Mr. Lincoln not stop making Fleetweld 5, Fleetweld 7, and Fleetweld 37 and just have Fleetweld 35 for an all-position electrode. My opinion is that the specification instead of being reduced, ought to be expanded further to define all the characteristics of E6010, E6011, E6012, etc., and to provide a check for these characteristics.

Of course, a universal electrode is desirable, but when and if it is developed it will be so different from any now on the market that it will rate a new type classification.

Mr. Lincoln next asks us why an electrode covering that is a good conductor of electricity is objectionable. Surely an electrode that arcs over at the top edges of a deep groove is not a good electrode, is it? Or one that might give the operator a shock whenever he touched it?

Then Mr. Lincoln asks what is an "injurious" defect in the covering. That seems easy. Any defect that has a deleterious effect on the usability or physical properties is injurious. Besides those mentioned, how about discontinuities, thin spots, variations in density, etc.? Does Mr. Lincoln tell his inspectors to allow such electrodes to be shipped?

Mr. Lincoln now claims to have demonstrated that what the consumer wants and needs is a simpler specification that gives better protection. I think that when it is analyzed carefully, the specification does a pretty fair job of protecting the consumer.

But, as a consumer with other things to do, I would welcome any simplification, although for my own interest, and in all fairness, I would insist that the specification remain mutually protective and *definite.* In this connection, a few questions come to mind concerning the standards proposed by Mr. Lincoln, and I'd like to address these questions to Mr. Lincoln:

(1) When you say "mild steel" do you mean the same thing I do? There are many steels that are called "mild steel." Would you mind if I tested your electrodes on high sulfur, free-machining steel? Or if I tested it on a piece of coldrolled high-carbon steel? I call both of these mild steel sometimes.

(2) Would you care what current values, arc lengths, polarity, etc., I use in preparing the weld? Would you care whether or not the welder making the weld is qualified or not?

(3) Are you certain that a weld that is good in tension is also good in impact and fatigue?

(4) Would you guarantee that an electrode that will break the plate in a flat groove weld will therefore make a fillet in the vertical position? Do you recommend Fleetweld 9 for this application? How do you indicate the difference?

The answers to the above questions seem so ridiculously obvious I conclude that either I have overlooked some equally obvious argument in favor of Mr. Lincoln's proposal, or the whole campaign is a shrewd publicity stunt. However, on the face of it it seems logical to conclude that each of these items *should* be defined and controlled for the mutual protection of producer and consumer?

And when an exact definition of mild steel has been included; and standard conditions for making and testing a weld have been established; and tests to prove that the electrode will do what the producer claims, with respect to positions, currents, polarity, etc., have been provided; and some electrode naming system that can be used on bills of material, drawings, etc., has been devised; do you not end up with just what is A233-45T? Of course, it's hard to read.

It's a legal document, and what legal document was ever as interesting as *Forever Amber?*

W. M. WILKINSON,
Member, American Welding Society
113 W. Thornapple St.,
Chevy Chase, Md.

Improving the Machinability of Heat-Treated Parts by Wheelabrating

By J. R. McAllister, Plant Metallurgist
Syracuse Heat Treating Co., Syracuse, N.Y.

At the Syracuse Heat Treating Company, Syracuse, New York, one of the leading Eastern heat treating concerns, three Wheelabrator Tumblasts, a 15" x 20", a 20" x 27" and a 27" x 36", are employed to handle the complete cleaning of heat treated parts. With these machines they are equipped to process metal pieces weighing from a few ounces to over 75 pounds apiece.

Today, more and more companies in the various metal working industries are specifying heat treatments giving specific micro-structures and hardness requirements, but too few are giving the proper thought to surface condition both before machining and before final finishing operations, such as grinding, plating, coloring or polishing. There can be considerable saving of both precious time and money if the proper method of surface preparation is employed for the various finished conditions.

Forging Scale Usually of a Compound Nature

Let us take, for instance, rough forgings that have been properly normalized and annealed for their particular machinability problem. Naturally, as the slug of steel is heated in ovens at the forging plant prior to forming under the hammer, it oxidizes due to the relatively high temperatures needed to condition the steel for hammering. Plus having this scale formed by the oxidation of the metal, it can be noted under the microscope that a large percentage of the surface has been burned away by the oxygen in the surrounding air. The so-called forging scale formed under these conditions is usually of a compound nature having a layer of rather tight scale covered by loose or "feather" scale. The "tight" inner scale is formed in the heating furnaces under the hammer and the loose "feather" is formed on cooling after the piece has been forged into shape. After the forging is cold, it is sent to the heat treater, who then takes his turn at adding and subtracting to the scale condition of the piece. Some of the loose forging scale will drop off while handling from one department to another and more will become free in the heat treating furnace, but chances are that the furnace heat will replace a good share of this loose scale because atmospheres are not generally watched too closely on this rough grade of work.

The Problem of Machining

Now that the forging and heat treating operations are complete and we have a supply of scale which is very hard and brittle, and decarburization which is very soft and weak, our problem is to get a tool to make an even and uniform cut along the surface. This is not a simple problem with the material in this condition. The tool will often times get under way in a normal manner in the soft matrix of decarburization and suddenly hit a hard spot of scale. The easiest thing for the tool to do under these conditions is to break and sometimes cause a many-thousand-dollar shutdown.

There are two major methods of eliminating this condition before machining operations are started. One is pickling and the other is some method of blasting the work with sand, steel grit, or steel shot. The pickling method is being used less and less by commercial heat treaters and forgers because of the danger of pitting the work too deeply so it cannot be cleaned up and also because of the general messiness of the operation.

Removing Scale Down to Virgin Metal

With the use of Wheelabrator Airless speed cleaning machines the removal of heat treat scale is a simple matter because the hard hitting steel abrasive quickly removes the baked-on-scale right down to the virgin metal. Every nook and cranny of the part is completely scoured until every last vestige of scale is removed.

The Wheelabrator method of cleaning is also very effective for removing heat treating scale from machined parts or castings before grinding, plating, coloring and polishing. When cleaning before grinding, the use of a medium sized grit or shot will leave the surface bright and smooth, thus keeping the grinding wheels from loading up with scale and dirt. It is also found that a much larger percentage of work can be ground between wheel trimming operations if a clean scale-free surface is used.

The use of grit blasting for surface preparation of metal to be painted or plated is advisable because the smooth surface is broken up by the force and sharp points of the grit.

American
FOUNDRY EQUIPMENT CO.
510 S. Byrkit St., Mishawaka, Ind.

This Industrial Week . . .

- **Labor Day Seen as Turning Point**
- **Reconversion Gaining Rapidly**
- **Nonrated Orders Expanding**

WITH a promise of a strong upward trend in activity, post-Labor Day reopenings found the steel industry on the home stretch as far as reconversion problems were concerned. During the past week order volume has been heavy, steel ingot operations have been slowly climbing upward, steel consumer reconversion has been taking place at a much faster rate than had been expected and normal market factors such as prices and wages have begun to put in more of an appearance than has been customary in the war period.

While CMP orders will continue to be delivered during September, all steel companies expect a substantial increase this month in nonrated business, for shipment as soon as schedules reach a more normal level. Those industries such as railroad car freight builders, railroads and can makers already have substantial orders on steel mill books and expect a minimum amount of reconversion troubles. Deliveries to those industries are expected to be heavy, therefore, for some time to come. Meanwhile the automobile industry is gearing itself for much higher output of new cars than quotas would have allowed with the result that pressure from Detroit upon the steel industry is and will be greater.

The oil industry is also coming into the market for heavy quantities of steel. It is understood that oil companies are especially interested in the production of "one trip" steel drums. Some sources believe that steel requirements over the next several months for this production alone will approximate the Army's need for it. Over the past few years stocks of oil well casing and drill pipe have dwindled and now that the bomb programs have been practically eliminated, heavy ordering of oil country goods is currently in the making.

On an overall basis total order volume in this past week has been relatively heavy. Despite heavy cancellations during August, some mills report that new order volume has just about balanced their losses. Cancellations are now at a normal rate and most steel mills have already put new schedules for finishing units into effect right on the heels of the war business cancellations experienced over the past few weeks.

SOME mills are still refusing to take business for which definite delivery commitments are required. Furthermore, the action of some steel companies in setting up informal rationing among customers is reacting unfavorably among certain customers. This practice, of course, was adopted because of the tremendous pressure from a great many consumers for limited amounts of available nonrated steel.

Demand for flat rolled products continues to be far in excess of mill capacity to produce. However, tentative deliveries on strip, hot rolled sheets, cold rolled sheets and hot rolled pickled sheets and strip have moved into the fourth quarter compared to early 1946 promises made a month ago. Some firms have November openings for cold rolled sheets, December schedules for hot rolled strip, October for hot rolled sheets and hot rolled pickled sheets, and December for hot rolled strip. These tentative delivery promises are not uniform throughout the industry.

Even though all steel mills were shut down over Labor Day, the drop in steel ingot output this week was negligible because of forced closings last week resulting from reconversion problems. Steel ingot output declined one point to 76 pct of rated capacity this week. With scheduling difficulties being rapidly cleared and with order volume holding up to a higher level than was expected, steel ingot output over the next several weeks is expected to climb slowly to a level somewhere between 80 and 85 pct of rated capacity. The latter will represent an economic schedule of operations which will exclude the use of obsolete and high cost equipment which had to be operated during the war.

With steel companies having lost nearly all of their volume-guaranteeing war contracts and with wage costs relatively high, the entire industry is intensely interested in possible ceiling price increases. Most of the common steel products are, according to steel companies, being made today either at a loss or at a break-even point. Some companies have been forced to go to a 40-hr week in order to reduce their overhead, but this action has not been entirely successful because labor shortages still exist in steel plants despite layoffs elsewhere. Most of the shortages are occurring in finishing mills where skilled workers are needed to process such products as cold rolled sheets, strip, galvanized sheets and other peacetime steel products which require more finishing operations than did the output of the war period.

WHILE there is no official confirmation this week, the sad plight of steel company earnings, now that war cancellations have been effected, indicates that once again steel prices are being analyzed by OPA for the purpose of granting some type of relief. The steel industry had asked for a general price increase, but judging from past performance the OPA will probably recommend and approve specific product price revisions covering those items on which the return is the least or the loss the greatest. Due to the immense amount of paper work involved it may be November before any price revisions are announced.

According to reports received from abroad, out of the 122 blast furnaces which were left undestroyed by the war in France and Lorraine, only 39 were in blast on July 31, with a daily average capacity of only 270 tons.

• **STEEL PRICES**—A steel price rise is in the wind. OPA is now making final check on data submitted by steel companies. Some reports indicate that steel companies have asked for as much as $7 a ton on many products. It is unlikely that such an amount will be granted. Steel companies wanted a raise "across the board," but OPA insists that adjustments shall be on specific products. The ultimate increase will come later this year, probably not much before November. Indications are that finished steel products on which the smaller companies are losing money and on which many of the larger companies show a deficit will be raised in a manner comparable to the last price increase which ranged from $2 to $3 a ton on the more common items and $5 a ton on others. High labor costs and loss of war contracts as well as relief for smaller steel companies are factors in the current price increase request.

• **STEEL PRODUCTION**—Steel companies may stabilize the ingot rate between 80 and 85 pct of capacity after stragglers return to work and the cancellation problem has been licked. An operating rate of more than 90 pct would involve the use of obsolete or high cost equipment not conducive to producing a profit for the steel companies involved. With all companies cost conscious and with the profit margin limited, the return of civilian business to the books demands an economical operation between pattern both in the openhearth and in the finishing mill departments. War orders were usually of one size and grade and involved long runs, with the result that volume paid dividends. Civilian business as a rule includes small orders, many sizes and grades and innumerable roll changes on the mill. Present percentage of capacity figures do not tell the whole story because they are based upon a total capacity which includes equipment which will probably not again be used. The excess of electric steel capacity also tends to bring down the operating figure.

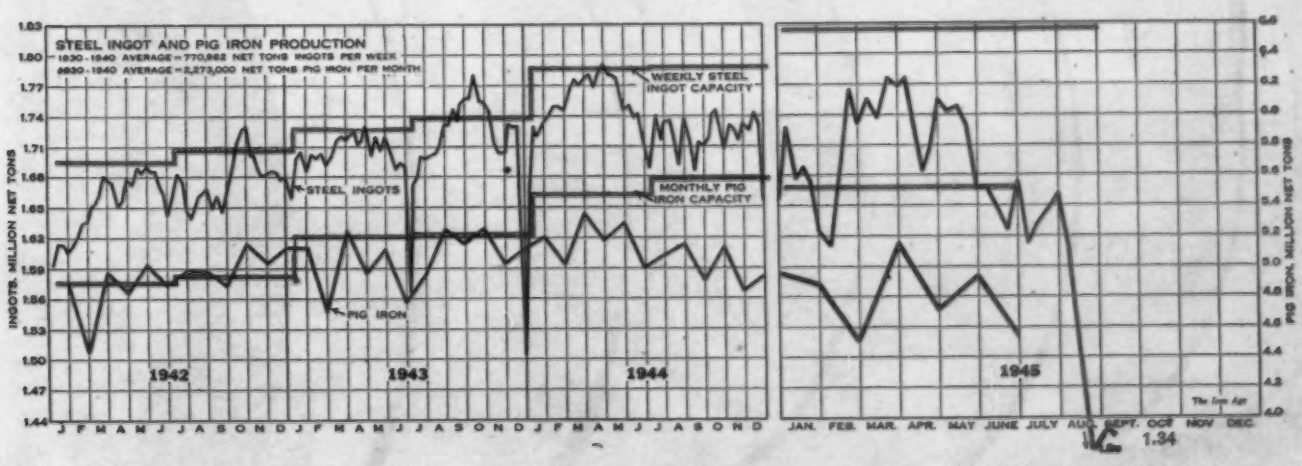
• **1946 FOUNDRY SHOW**—Plans to stage its 50th anniversary Foundry Congress and Foundry Show in the Cleveland Auditorium, Cleveland, in May 1946, have been announced by the American Foundrymen's Assn. The association plans to stage the event as an international foundry congress with attendance of foundrymen from England, France, Belgium, Russia, Mexico, South America, South Africa, Australia, China and other countries. If held, this will be the third international foundry congress to which the American Foundrymen's Assn. has played host, the first being held in Detroit in 1926, the second in Philadelphia in 1934.

• **40-HR WEEK IN STEEL**—Low steel prices coupled with labor costs has caused steel mills to attempt to revert to the 40-hr week. Despite this most steel companies are now hiring employees instead of laying them off. In the Pittsburgh district alone there has been little success in obtaining thousands of new applicants. As long as present prices continue it is certain that overtime in the steel industry will be kept at a minimum.

• **OPA STEEL PRICE CONTROL**—On ordinary steel products where the demand outruns the supply, OPA will probably keep its controls for some time as far as raising prices is concerned. Not approved yet but recommended by OPA steel price section is the elimination of controls on stainless steel, pressure tubing, wire rope and tool steels. The excess of supply over demand for these items is said to present no price problem.

• **CROSS HAULING**—With steel profit now on a marginal basis and where every attempt to keep cost within bounds counts, many steel companies are eliminating costly cross hauling of steel products, especially semi-finished material. It is expected that as companies seek to reestablish their prewar customer relationships, dislocated steel sales to distant areas will be promptly eliminated.

• **STEEL FREIGHT RATE CASE**—Reopening of I. & S. Docket 5269 and related proceedings involving iron and steel freight rates from Illinois points and western trunk line territory to Iowa, Minnesota, upper Michigan, Missouri and Wisconsin, has been asked of the Interstate Commerce Commission by the Minneapolis Traffic Assn.; St. Paul Assn. of Commerce, and the Duluth Chamber of Commerce. (See THE IRON AGE, Aug. 9, 1945, p. 122.) The petition contends that the commission erred: (1) In failing to give proper weight to existing and potential water competition in disposing of section 3 issues; (2) in prescribing a base of rates related to the existing class rate structure in Western Trunk Line territory "which unquestionably will be scrapped in the near future," instead of the prescription of a distance scale for the movement of iron and steel articles; and (3) failing to prescribe an alternative base of rates subject to varying carload minima.


STEEL INGOT AND PIG IRON PRODUCTION
1930-1940 AVERAGE = 770,882 NET TONS INGOTS PER WEEK
1930-1940 AVERAGE = 2,273,000 NET TONS PIG IRON PER MONTH
WEEKLY STEEL INGOT CAPACITY
STEEL INGOTS
MONTHLY PIG IRON CAPACITY
PIG IRON
INGOTS, MILLION NET TONS
PIG IRON, MILLION NET TONS
1942
1943
1944
1945
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT NOV DEC
1.34

Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
August 28.....	66.5	82.0	67.5	89.0	87.5	73.5*	65.0	94.0	96.5	55.0	88.0	84.0	80.0	77.0
September 4....	68.0	72.0	74.5	88.5	87.5	73.5	75.0	94.0	97.0	55.0	82.0	84.0	80.0	76.0

* Revised

MESTA ROLLS

TURNING A MESTA SPECIAL ALLOY STEEL STRUCTURAL MILL ROLL USED IN PRODUCTION OF 4 INCH CHANNELS.

ARMY E NAVY

MESTA MACHINE COMPANY
PITTSBURGH, PA.

December Production to Hit 112 Pct

INDUSTRIES	Companies Reporting	Average Monthly Base Period	Actual Last Month	Estimate This Month	Forecast Dec. '54	Forecast June '46	$ (000) New Constr. & Equip. Before 6/30/46
Passenger Automobiles	11						188,234
$ (000) Production	....	219,000	287	3,000	201,000*	454,000	.....
Automobiles	....	313,678	359	3,897	223,656	504,452	.....
Allied Tractor Equip.	28						0
$ (000) Production	....	2,900	14,500	13,050	13,050	11,000	.....
Units (000)	....	.....	.....	.....	.....	.....	.....
Bituminous Equip.	26						0
$ (000) Production	....	860	1,550	1,395	1,395	1,395	.....
Units (000)	....	.....	.....	.....	.....	.....	.....
Concrete Equip. & Centrifugal Pumps	13						550
$ (000) Production	....	630	1,366	1,200	1,200	1,200	.....
Units (000)	....	.....	.....	.....	.....	.....	.....
Crushing Equip.	3						0
$ (000) Production	....	850	1,710	1,500	1,500	1,500	.....
Units (000)	....	.....	.....	.....	.....	.....	.....
Graders	4						154
$ (000) Production	....	1,500	2,900	2,600	2,600	2,600	.....
Units (000)	....	.....	.....	.....	.....	.....	.....
Miscellaneous Constr. Mach.	10						0
$ (000) Production	....	1,250	3,000	2,700	2,700	2,250	.....
Units (000)	....	.....	.....	.....	.....	.....	.....
Power Cranes & Shovels	21						295
$ (000) Production	....	3,360	11,900	10,700	10,700	8,900	.....
Units (000)	....	.....	.....	.....	.....	.....	.....
Road Rollers	4						0
$ (000) Production	....	360	600	540	540	540	.....
Units (000)	....	.....	.....	.....	.....	.....	.....
Tracklaying Tractors	4						1,231
$ (000) Production	....	5,750	22,000	20,000	20,000	16,500	.....
Units (000)	....	.....	.....	.....	.....	.....	.....
Appliances Small Elec.	17						310
$ (000) Production	....	5,871	1,896	1,941	8,753	10,570	.....
Units (000)	....	1,440	356	366	1,618	2,177	.....
Bicycles	12						125
$ (000) Production	....	2,983	956	1,063	3,091	6,288	.....
Units (000)	....	155	46	47	143	272	.....
Domestic Laundry Equip.	28						6,999
$ (000) Production	....	7,499	412	1,325	12,574	22,044	.....
Units (000)	....	186	8	23	268	495	.....
Domestic Mech. Refrig.	12						7,124
$ (000) Production	....	26,364	0	2,687	24,460	41,274	.....
Units (000)	....	316	0	34	279	474	.....
Domestic Sewing Mach.	4						632
$ (000) Production	....	2,251	0	110	1,338	2,495	.....
Units (000)	....	58	0	2	25	55	.....
Domestic Vacuum Cleaners	16						55
$ (000) Production	....	4,270	382	1,211	7,875	9,100	.....
Units (000)	....	217	14	23	199	272	.....
Electric Fans	10						75
$ (000) Production	....	888	721	774	2,018	2,656	.....
Units (000)	....	107	46	47	232	335	.....
Electric Ranges	16						875
$ (000) Production	....	3,584	738	798	4,117	7,535	.....
Units (000)	....	47	11	12	54	97	.....
Formed Steel Plumbing Fixs.	3						1,230
$ (000) Production	....	2,600	0	0	1,700	3,100	.....
(Tons of Steel)	....	3,500	0	0	2,900	4,700	.....
Heating Equipment Extended Surface	7						1,504
$ (000) Production	....	1,368	1,361	1,616	2,267	3,257	.....
Flashlight Cases	14						937
$ (000) Production	....	941	1,094	1,053	1,685	1,777	.....
Units (000)	....	2,225	1,805	1,723	3,294	3,635	.....
Metal Furniture	18						920
$ (000) Production	....	16,667	2,383	2,430	12,470	25,896	.....
Units (000)	....	.....	.....	.....	.....	.....	.....
Metal Vaults	17						0
$ (000) Production	....	444	0	0	965	883	.....
Units (000)	....	12	0	0	25	23	.....
Metal Caskets	12						.....
$ (000) Production	....	1,664	516	647	1,483	2,243	.....
Units (000)	....	22	3	4	19	28	.....
Farm Machinery	308						74,906
$ (000) Production	....	50,000	54,193	70,000	83,333	94,444	.....
Units (000)	....	.....	.....	.....	.....	.....	.....
Com. & Indust. Refrig. & Air Cond. Equip.	12						4,389
$ (000) Production	....	9,985	17,830	15,982	17,144	28,818	.....
Units (000)	....	.....	.....	.....	.....	.....	.....
Distributing Equip. Warm Air	11						2,140
$ (000) Production	....	2,716	1,700	2,000	2,453	3,000	.....
Short Tons (000)	....	10	7	8	9	13	.....
Fixtures Cast Iron Plumbing	11						1,072
$ (000) Production	....	4,700	550	880	2,500	4,400	.....
Pieces (000)	....	336	31	49	150	260	.....
Fixtures Plumb. Fit. and Trim	12						1,886
$ (000) Production	....	4,200	1,807	2,292	3,630	5,380	.....
Lbs. of Brass (000)	....	5,716	2,027	2,993	4,633	6,621	.....
Furnaces Warm Air	2						2,601
$ (000) Production	....	4,731	4,970	5,397	7,987	13,026	.....
Furnaces (000)	....	44	30	33	60	93	.....

(Continued on page 124)

Washington

• • • Production in a selected group of peacetime industries amounted to 46 pct of the 1939-1941 level during July, and is expected to amount to about 48 pct during August, according to the first reconversion report issued by Chairman J. A. Krug of the War Production Board. The report, based on returns from 3750 plants of 42 key industries indicated that production in these firms will be slightly above the prewar average by December of this year, and will reach 187 pct of the base month average by June of 1946.

Compiled by the use of a reporting system already set up for a large group of industries with which the WPB has been collaborating in the solution of major reconversion problems, the report is the first of what Mr. Krug hopes to make monthly statements on the progress of the reconversion of the war machine.

Included with statistics on the rate of planned output were figures indicating that the employment level in the same plants will jump from 51 pct of the base period in July of this year to 133 pct in June of next year. Prospects, according to reports from the companies, are that employment in these industries will be at about 96 pct of the 1939-1941 average by the end of this year.

According to Mr. Krug, the estimates as furnished to the WPB are probably reliable indications, inasmuch as the firms are inclined toward conservatism in their estimates. The estimates as reported represent the potential production; assuming that the markets for the products exist.

The 133 pct employment level, Mr. Krug emphasized, does not indicate that there will be no unemployment problem next year. The industries represented are not principally the large war producers, excepting the automotive firms. For example, the ordnance works, aircraft plants, and shipyards, which are laying off huge quantities of men, are not included in the survey. If these figures were added, the 133 pct figure for next year would drop off sharply.

According to Mr. Krug, many of the component and tool shortages which were serious last month will be eliminated by the last quarter of the year, or by January, 1946.

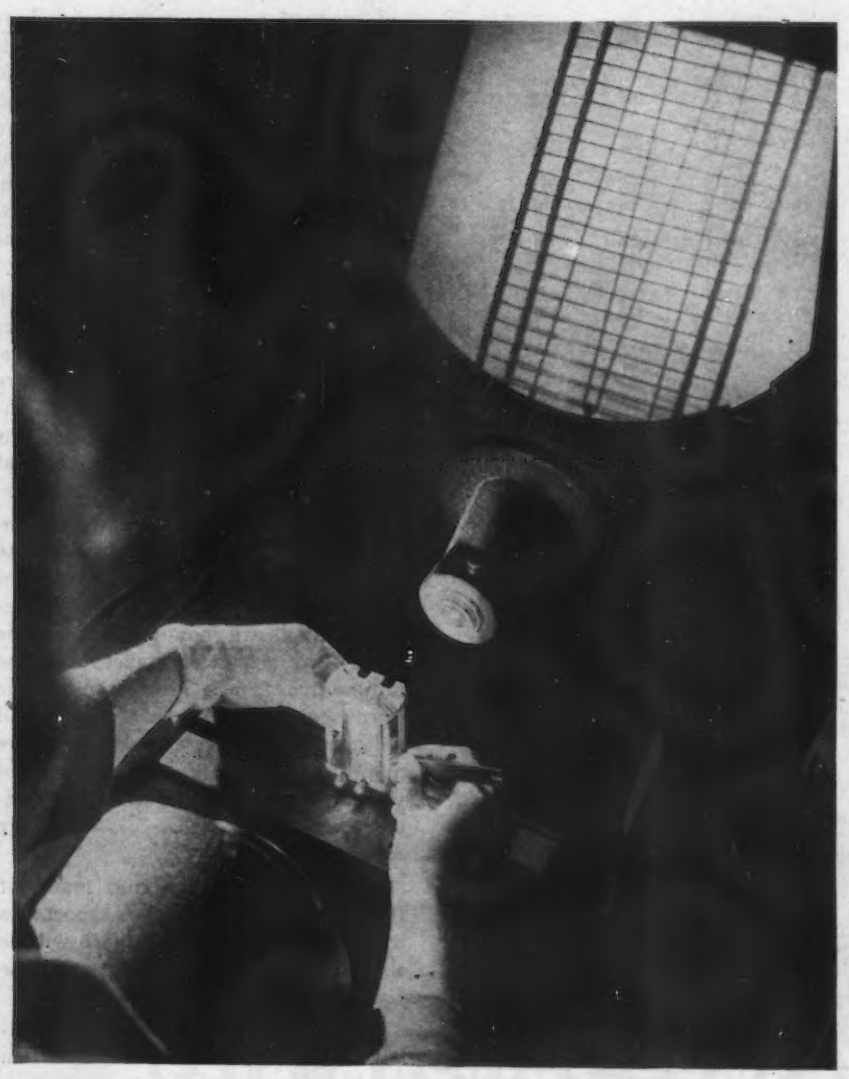
In the table adjoining, both dollar valuations and units of production

(*Continued from Page 123*)

INDUSTRIES	Companies Reporting	Average Monthly Base Period	Actual Last Month	Estimate This Month	Forecast Dec. '45	Forecast June '46	$ (000) New Constr. & Equip. Before 6/30/46
Soil Pipe & Fittings Cast Iron	52	.....	.....	.....	.....	.....	600
$ (000) Production	....	3,300	885	885	1,400	2,100	.....
Tons (000)	....	47	13	13	20	30	.....
Stoves Dom. Cook & Heat	79	.....	.....	.....	.....	.....	23,400
$ (000) Production	....	17,675	12,200	12,400	19,200	30,250	.....
Stoves (000)	....	738	315	348	619	955	.....
Printing Trades Mach.	18	.....	.....	.....	.....	.....	840
$ (000) Production	....	5,645	2,030	1,813	4,244	7,808	.....
Units (000)	....	.....	.....	.....	.....	.....	.....
Com. Laund. & Dry Clean. Tailor Pressing Mach.	4	.....	.....	.....	.....	.....	185
$ (000) Production	....	2,604	3,310	2,930	3,781	4,156	.....
Units (000)	....	.....	.....	.....	.....	.....	.....
Floor Finishing & Floor Maintenance Mach.	2	.....	.....	.....	.....	.....	40
$ (000) Production	....	301	329	487	497	650	.....
Units (000)	....	2	2	3	3	4	.....
Railroad Passenger Cars	2	.....	.....	.....	.....	.....	5,978
$ (000) Production	....	3,576	0	0	652	14,929	.....
Units	....	42	0	0	8	175	.....

for many industries are included. The dollar figures have not been adjusted for the variations in value of the dollar, which will also tend to decrease the valuation of the production in dollars.

SHADOWGRAPH: *Filaments of transmitting tubes are thus inspected at North American Phillips' Dobbs Ferry, N. Y. plant.*



European Steel Marts Still Reflect Supply And Price Dislocation

Barcelona, Spain

• • • **Domestic prices for iron and steel in Europe show the most diversified deviations from prewar standards. One ton of openhearth steel ingots, for example, converted to dollars at the official exchange rate, is quoted in Portugal at $163; in Spain, at $108; in Sweden, at $74; in Switzerland at $102; in Turkey at $178, and in France at $94, f.o.b. warehouse for 10-ton lots. In all other countries no fixed price schedule exists.**

Freight rates for iron and steel products are in sharp decline. During the war, one ton of steel was shipped from New York to Lisbon at $48 to $52 per ton plus 4 to 5 pct insurance. The rate at present has dropped to $23 to $25 plus 1.7 pct insurance, but both shipping rates and insurance fees are still falling.

The rates from Europe to African ports were lowered approximately 60 pct and to Latin America 45 to 50 pct. Although tonnage is still scarce, the trade volume is so small that the reappearance of a few vessels on the freight market has had a depressing effect upon rates.

The British iron and steel industry has not yet reappeared in European markets and in Africa. With the exception of tinplate exported to the Iberian Peninsula in partial compensation for packed fish, export quotations from Great Britain are not obtainable.

Sweden, with which Africa and the Iberian Peninsula have resumed direct shipping connections, is dominating the market in alloy steels, tool steels and electrical machinery. The representatives of the Belgian and Luxembourgian iron and steel industry have informed their old customer that there is no possibility of obtaining any iron and steel products from these countries for the rest of this year. No quotations are given.

The scarcity of machine tools is paramount. All European markets, Sweden included, are in need of very great quantities of machine tools. The plants are working with obsolete equipment and no possibility of replacement is in view. Efforts, mainly of Swiss buyers, to purchase American tools have not yet met with results. The unfilled demand of the Spanish industry for tools has been

estimated at approximately $130 million.

Of the 122 blast furnaces in France and Lorraine which were left undestroyed by the war, only 39 were in blast on July 31 with a daily average capacity of 270 tons. In Italy out of a total of 16, only four furnaces having a daily capacity of 350 tons each were in blast, and in Belgium 29 of its 81 furnaces were going. Daily average capacity of these furnaces is 260 tons each. Output in Luxembourg, Germany and Czechoslovakia is unknown.

According to Swiss sources, the Styrian (Austrian) pig iron works of Dojnaqitz with five blast furnaces having a total daily capacity of 1900 tons are idle and most of the equipment has been dismantled and sent to Russia. The Hungarian and Rumanian iron and steel industry is also said to be idle and the equipment transported to the Soviet Union.

Steep Rock Ore Output To Exceed 1000 Tons Daily in Near Future

Washington

• • • Production at Steep Rock iron ore mine near Atikoken, Ont., reached 1000 short tons daily early in June and was expected to be even higher before the end of the month, according to reports received by the Dept. of Commerce.

Ultimate annual production equal to 2,000,000 tons of iron ore is anticipated. The mine did not go into production until late in 1944, but from then until the close of the shipping season its output totaled 16,551 short tons of high grade ore, practically all of which is being exported to the United States.

Despite the widespread occurrence of iron ore in Ontario, the only other iron ore mine in the Province is the Helen mine at Michipicoten, whose production was 536,701 short tons in 1944. Although shipments from either mine have not been very large they represent the bulk of iron ore moved from Canadian mines and indicate an increase of more than 400 pct from the 1939 figures.

The pig iron and primary iron and steel manufacturing industries of Ontario also had an important growth during the war. From an output of 556,186 short tons in 1939, production of pig iron was increased to an estimated 1,412,546 short tons in 1943. Figures on the Ontario production tonnage are not available, but the value of production in the primary iron and steel industries in the province increased from $48,925,939 in 1939 to $159,789,376 in 1943.

Three Ontario firms operate blast furnaces and 27 engage in primary iron and steel manufacture. The production of pig iron in Ontario represents approximately 80 pct of the total Canadian output, and that of the primary iron and steel industries, 71 pct of total Canadian production.

A considerable amount of raw material used by the various Ontario companies comes from the United States, iron ore and scrap as well as approximately 1,200,000 tons of steel being imported annually.

All of the companies have experienced production shifts during the war. The number of alloys being produced has increased and the sizes and shapes of manufactured articles have changed. The elimination of peacetime lines, meanwhile, has permitted more concentration and therefore greater efficiency in the production of the grades singled out for manufacture. Considering the skill and experience thus developed, the primary iron and steel industry probably will be able to turn out a wider variety as well as a larger volume of products after reconversion than before 1940. No information is available concerning the expansion of production facilities, but employment has nearly tripled and the value of production has quadrupled.

Large quantities of bars, sheets, and structural forms have been exported, principally to South America, Australia, India, South Africa and Russia during the war. Primary producers anticipate that the greater part of postwar exports will be in the form of manufactured products, especially railway equipment and agricultural machinery, but special steels and alloys will probably be exported in unmanufactured form.

PIG IRON OUTPUT: *Blast furnaces in the United States operated at 84.1 pct of capacity in July according to the American Iron & Steel Inst. That the rate may be lower when August figures are available seems likely in view of the drop in steel operating rates. While the rate for July was slightly higher than for June the rise was negligible.*

Blast Furnace Capacity and Production—Net Tons

Source: American Iron & Steel Institute

	Number of Companies	Annual Blast Furnace Capacity	PRODUCTION							
			PIG IRON		FERRO-MANGANESE AND SPIEGEL		TOTAL			
									Per Cent of Capacity	
			July	Year to Date	July	Year to Date	July	Year to Date	July	Year to Date
DISTRIBUTION BY DISTRICTS:										
Eastern	12	12,988,970	818,499	5,861,728	34,357	219,217	852,856	6,080,945	77.5	80.6
Pittsburgh-Youngstown	15	25,904,240	1,996,429	13,680,155	23,894	144,351	2,020,323	13,824,506	92.0	91.9
Cleveland-Detroit	7	6,589,500	435,084	3,408,646			435,084	3,408,646	77.9	89.0
Chicago	7	14,070,510	992,129	7,263,583		15,136	992,129	7,278,719	83.2	89.0
Southern	8	4,924,670	350,969	2,187,027	9,098	85,603	359,767	2,272,630	88.2	79.4
Western	4	2,838,000	141,317	1,089,356			141,317	1,089,356	56.8	66.1
TOTAL	37	67,313,890	4,734,118	33,490,495	67,349	464,207	4,801,467	33,954,702	84.1	86.8

Nickel Industry Girds for Peace With New Products

New York

• • • Now that nickel has been freed by the end of the war for unrestricted civilian use, the nickel industry once more bases postwar market prospects upon the findings of its research laboratories and the cooperative activities of its engineering development staff.

Prewar analyses of the breakdown of world nickel consumption indicate that by far the largest peacetime tonnage of nickel is consumed as an alloying agent for steels, including the SAE constructional steels, stainless steels and other corrosion and heat resistant steels, and steel castings. This group of applications is estimated to take from 50 pct to 60 pct of the nickel consumed.

However, wartime controls required to stretch the available supplies of the metal may be expected to affect the industry's marketing prospects in this field. The NE steels which require no primary nickel but contain from 0.20 pct to 0.70 pct nickel together with small percentages of chromium and molybdenum, recovered largely by the use of alloy scrap, are believed to be highly approved by most consumers and likely to be acceptable in postwar markets. True, there are reports that certain manufacturers are champing at the bit to have their products return to the more highly alloyed nickel alloy steels. But these are not the big tonnage consumers like the automobile manufacturers and perhaps even the farm equipment manufacturers.

Having become accustomed to the use of the NE steels, it is generally conceded that manufacturers will continue to call for many of them. The high residual alloy content of present day scrap, which in the case of nickel is due largely to the production of vast quantities of 5 pct nickel-containing armor plate during the war, makes them economical to use.

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By JOHN ANTHONY

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But industry members believe that the tremendous expansion in the use of alloy steels during the war will also carry over into the postwar period and be reflected in nickel consumption by the NE steels to supplement the use of alloy scrap. Moreover they contemplate a large increase in use of the low alloy high strength steels, the heat and corrosion resistant alloy steels and the stainless steels, most of which contain nickel.

It is widely recognized that SAE 3300 and other nickel-containing carburizing steels will continue in demand postwar. But a price relationship has given a slight edge marketwise to SAE 4100 and NE 8600 or NE 8700 when compared with SAE 3100, it is generally conceded. Likewise, SAE 2300 may give ground to SAE 4600; and SAE 2500, to SAE 3300. If these shifts in consumption take place as anticipated, each one represents a loss in nickel demand.

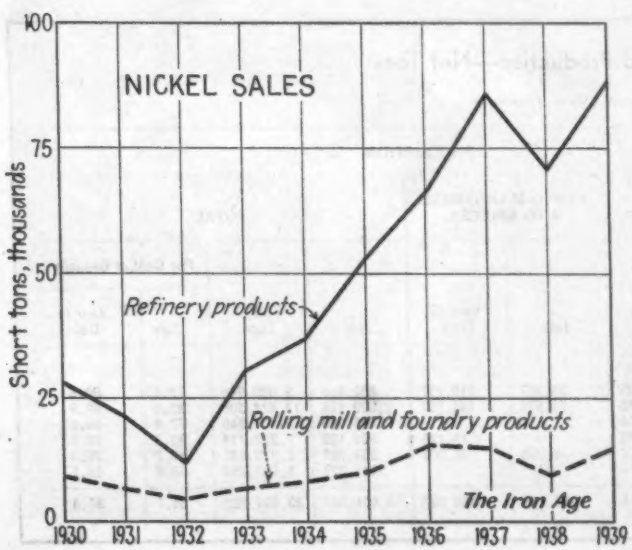
There is considerable interest in a new laboratory-developed ferritic 8.5 pct nickel steel which is said to have good mechanical properties at very low temperatures, at least as low as —200°F. This steel, now in experimental production by the Lukens Steel Co., may offer some prospect of use at the low temperatures involved in petroleum dewaxing and in liquid air equipment. It is said to have good strength in the normalized condition. It may also be given consideration as tubing for paper mills where commonly 3.5 pct to 5 pct nickel steel has been used, but where during the war inquiry has developed for a 10 pct nickel steel. Special wetting properties are said to encourage consideration for solder rolls.

Several steel foundries are now running experimental precision casting operations for heat resistant alloys containing high nickel contents.

Another lucrative market, in prewar tonnage consumed, is the electroplating field, nickel anodes and salts consuming 8 pct to 10 pct of total nickel consumption. Before the war, research work conducted by the National Bureau of Standards and the American Society for Testing Materials confirmed the opinion of practical observers that the degree of protection of steel from corrosion was a function of the thickness of nickel or nickel and copper deposited. There was no relationship between protection and the quality and thickness of chromium, which is at best only a flash coating.

Prewar, several automobile producers were about to go into production on bumper bars and other trim carrying 0.001 in. nickel plate. Independent suppliers of bright metal auto hardware had already led the way with great improvement in corrosion protection. Now there are reports that several large auto manufacturers are considering specifications for as much as 0.00225 in. nickel or nickel and copper for bumper bars and other bright metal work. Nor is this market confined to the most expensive cars in the line, in one make being considered for the least expensive model.

Of course, it is recognized that there will be some loss of the electroplate market to the plastics field. But it is expected to see a gain in engi-



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PEACETIME NICKEL PRODUCTS: *Sales of the International Nickel Co. as reported by the American Bureau of Metal Statistics. Refinery products are for alloying and electroplating; rolling mill and foundry products show nickel content only.*

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neering electrodeposits of nickel for electroforming of some parts and for reclaiming worn or mismachined parts of high value, prewar reaching thicknesses of 0.2 in.

Another lucrative market for nickel alloys is comprised of rolling mill products including Monel, Inconel and other rolled and drawn forms of nickel. In order to extrude these tough metals, the International Nickel Co., by far the largest producer of nickel and nickel alloys, has installed one of the largest extrusion presses in the U. S. at the rolling mill at Huntington, W. Va. This press, operating with a force of 4000 tons, is said to have cost $1.25 million. During the war the press was called upon by the Army and Navy to break the bottleneck in the production of rotating copper alloy shell bands of large size. A production rate was reached of 180,000 8-in. diam bands per month together with an equivalent number of 5-in. bands, and additional production of extruded high nickel alloys for war applications.

During the war it was possible to continue with developmental work on high nickel alloys at the rolling mill and heats of a number of new alloys were poured. Several are valuable for precipitation hardening characteristics, including a new age-hardenable Inconel and a series of hardenable copper, nickel, manganese alloys containing 40 to 75 pct copper, with the remainder substantially equal parts of manganese and nickel. Then there is the firmly established age-hardenable K-Monel which is in demand by the petroleum industry for such items as drill collars in non-magnetic work and strings of sucker rods in corrosive fields.

In foundry products the shortage of tin, which may be expected to continue over the next year or so, offers marketing possibilities for the replacement of tin in brass or bronze castings, in part or completely by nickel. A proposed Navy specification covering gunmetal bronze calls for the replacement of approximately 4 pct of the 10 pct tin content with nickel. The Navy report on this alloy indicates it to have higher strength, better castability, and sea water resistance equal to hydraulic bronze.

A nickel-containing inoculant for cast iron developed during the war is expected to be placed on the market in the next few months. Many of the alloys referred to will not be commercially available until producers can get under way and also work out marketing arrangements.

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NICKEL PICTURE: *Canadian and world producers may be expected to compete for a smaller peacetime nickel demand. Production statistics from U.S. Bureau of Mines, world production estimated since 1939. Estimated consumption statistics from the American Bureau of Metal Statistics.*

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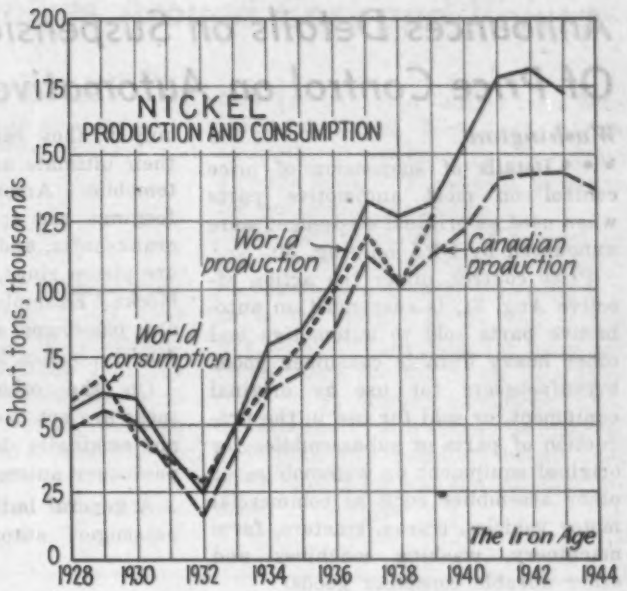

The International Nickel Co. is placing greater emphasis on the marketing of stainless steels in the postwar period than ever before. Both Monel and stainless are being pushed for the fields to which they are best adapted. Not much effort will be expended on Monel in the future for the appearance field. Meanwhile, there is some talk of an expansion of the number of field offices of the Development and Research Div. and evidence of attempting to staff them with men experienced in foundry engineering.

An effort by the Allies to decentralize and increase production has resulted in a war-born competitor to International Nickel being established in Cuba with the aid of DPC funds. Mining low-grade Cuban ore, the Nicaro Nickel Co., subsidiary of the Freeport Sulfur Co., has recently started producing about 10 pct of the nickel consumed largely in the form of nickel oxide which is used for direct alloying by the steel industry. However, it has been necessary to bag or can the product in order to prevent loss up the flue. The Nicaro refinery is located at Wilmington, Del., and the entire DPC plant was reported to have lost approximately $33.5 million.

Competition between these two companies is rather difficult to anticipate because of the fact that International Nickel's ore approximates 4 pct nickel content and it has as by-products the lucrative platinum group metals in large quantities, in fact it is the largest producer of these metals in the world. During the war when platinum production was needed exclusively for war purposes, the company inaugurated a promotional program to push palladium for use in jewelry. However, there is every evidence that the jewelry market will return to platinum now that it has been made available again.

Virtually all Canadian output is derived from the copper nickel ores of the Sudbury district, Ontario. The International Nickel Co. of Canada, Ltd., and Falconbridge Nickel Mines, Ltd., are the principal producers. During 1943 the former produced 148,000 short tons, slightly less in 1944 due to the labor shortage, of which approximately 17,500 tons represented ore production from Falconbridge, New Caledonia, and other sources. Production statistics of the New Caledonian deposits which are relatively low grade, indicate that this source for nickel is slowly tapering off.

The International Co. development at Petsamo in Finland has been bought outright by the Russian government for $20 million at the conclusion of the war with Germany.

The International Nickel Co. metallurgical processes are under study in an endeavor to work out improvements leading to lower production costs. It reports having handled enormous tonnages of lower grade ore during the war period in order to supply United Nations' requirements. While unable to conduct continuous mine exploration during the war, diamond drilling has been continued and it is expected that the additional tonnage added to reserves by this activity may reach the equivalent of nickel consumption during the war.

Announces Details on Suspension Of Price Control on Automotive Parts

Washington

• • • Details of suspension of price control on most automotive parts when used as original equipment were announced by OPA on Aug. 30.

Price control, under the action effective Aug. 31, is suspended on automotive parts sold to automotive and other heavy durable consumer goods manufacturers for use as original equipment, or sold for use in the production of parts or subassemblies for original equipment on automobiles or other assemblies such as commercial motor vehicles, trucks, tractors, farm machinery, washing machines and other durable consumer goods.

An automotive parts manufacturer may not increase his price for a part sold to a truck or farm machinery manufacturer, for instance, beyond the increase in price to a maker of new passenger automobiles.

Continued price control on passenger automobiles and other complete assemblies, OPA said, in effect provides indirect control over the parts prices.

Effective Aug. 31, 1945, manufacturers of automotive parts sold to manufacturers for use as original equipment will be required to notify OPA of all increases in prices so that the price agency will have up-to-date knowledge as to going prices. The price agency, it was emphasized, will intervene by restoring control at the first indication of inflationary price tendencies.

In addition, within the 10 days following Aug. 31, 1945, a substantial part of the industry is required to submit information required for the application of the reconversion pricing formula to their companies.

This information will be used for checking parts prices to see whether any increases that may be charged are in line with OPA's reconversion pricing standards. At the same time, it will provide information that OPA can, if necessary, use in checking the reconversion formula as applied to particular automobile manufacturers.

Passenger automobile parts are defined as any specific part, subassembly, or accessory, with certain exceptions, originally designed for use in a passenger automobile and fabricated to an extent that it may be identified as to its ultimate use in a passenger automobile.

Castings and forgings are "parts" only if they can be identified as to their ultimate use in a passenger automobile. Among such identifiable forgings are spindle bolts and axle crankshafts, and among such castings are piston rings, pistons and cylinder blocks. Examples of stampings that are passenger automobile parts are fenders, bodies, bumpers and brackets.

On the other hand, upholstery tacks are not "parts," since they were not originally designed for use in a passenger automobile.

A general but not exclusive list of passenger automobile parts upon which price control is being suspended follows:

Automotive gears, steering assemblies, knee action front ends, conventional type front axles, suspension springs, wheels and hub and drum assemblies, bearings, connecting rods, valves, valve springs, shock absorbers, body hardware, fan belts, armatures (motor and generator and wiper motors), brake systems, transmissions, oil filters, coils and electrical parts, heaters and defrosters, brake parts and brake drums, engine assemblies, radiators, horns or warning signaling devices, drag links, moldings, oil and water pumps, propeller shafts, window regulators, rear axle shafts, ring and pinion gears, cylinder sleeves, speedometers, brake shoes.

Cleveland Industry Reconversion Getting Under Way Quickly

Cleveland

• • • Reconversion is fast getting under way at most of this district's plants, and at least two of those companies that had heavy layoffs after V-J Day have started hiring again. Weatherhead Co., producers of a wide variety of aircraft fittings, have at least partially converted over to the production of automobile parts and have rehired 1800 of the 3300 laid off. Weatherhead is working 40 hours a week, with two shifts in operation.

The Aluminum Co. of America's Cleveland plant likewise got back into production in rather short order, when it hired back 1000 against a layoff last week of 3000. Other manufacturers such as White Motor Co., and Lincoln Electric Co., had no layoff problem, and White Motor is increasing its production personnel. In cases where no layoffs were necessary because of the fact that reconversion was either already about completed or because none was necessary, production of civilian items is expected to start immediately.

Despite the fact that these companies are going ahead with great speed toward production of civilian items, there are many companies in the district where the layoffs have been severe and where many will be permanent. Mullins Mfg. Co. closed its Youngstown Pressed Steel Div., Youngstown, completely until further notice, discharging about 1000 employees. Mullins normally made a variety of sheet steel items such as refrigerator cases, sinks and other household fixtures.

Thompson Aircraft Products Co. laid off about 4300 of its employees and hopes to be able to rehire about 2100 within the next three months. At Thompson Products Co., layoffs totaled about 800. Jack & Heintz, Inc., laid off about 6500 "associates" with the expectation that 4000 of these layoffs will be permanent.

National Bronze & Aluminum Co. expects that it will be able to rehire about 2500 of its layoffs, while Apex Electric & Mfg. Co. has laid off 1500. Cleveland Pneumatic Tool Co. laid off 3000 from its main plant and 2000 from its Aerol plant. Fisher Aircraft dismissals at plant No. 2 totaled 7000, Tapco's dismissals numbered 7500, and General Electric Co. laid off 1200 in Cleveland.

Home Appliance Survey

Chicago

• • • Commonwealth Edison Co. has conducted surveys indicating potential sales of representative home appliances in Chicago by all types of dealers in the first two postwar years. The estimates include:

	First Year	Second Year
Refrigerators with freezer compart.	50,000	90,000
Refrigerators	50,000	35,000
Radios	186,000	280,000
Washers	50,000	75,000
Ranges	16,000	27,000
Water heaters	5,500	13,500
Electric blankets	7,500	15,000
Freezer units	5,000	10,000
Dishwashers	2,500	4,500
Ironers	10,000	15,000
Clothes dryers	2,000	4,000
Room coolers	1,000	2,000

Postwar Aluminum Marketing Revolves Around Cost and Volume

Pittsburgh

• • • Much has been written about the postwar world and the bright days ahead after Japan has been crushed. Economists on all sides point to the pent up demand for civilian goods—vacuum cleaners, radios, refrigerators, electric irons, washing machines, toasters and automobiles, to mention only a few items — as an omen of peacetime prosperity.

The Aluminum Co. of America is optimistic about its future in this postwar world, but it is not minimizing the difficulties ahead. In 1939, America produced approximately 327 million lb of aluminum. In the postwar era, privately owned plants will have capacity for 1 billion lb of aluminum per year, and there will be government owned plants with a capacity for 1 billion lb per year. Obviously, vast new markets must be created.

The development of commercial markets for aluminum has been achieved largely by replacing older and better known metals and materials, such as steel, nickel, tin, zinc, copper, lead, glass, and wood. In many instances, however, new markets have been created for aluminum without displacing other metals, as in the airplane industry. In competing for new markets, aluminum has many advantageous characteristics that will stimulate its use, chief among which are light weight and resistance to corrosion. Looking at the broad postwar market, however, four factors will, in general, influence its use.

The first of these is price. At the beginning of 1940 the price of ingot aluminum was 20¢ a lb. Alcoa has made a number of reductions in price so that aluminum which sold for 20¢ a lb in ingot form on Jan. 1, 1940, is now selling for 14¢ a lb in pig form. Today, a large part of the demand for aluminum metal is in pig form.

In the last analysis, when dealing with a product, the uses for which can be largely extended only by replacing other materials or by finding new uses, the opportunity for long range growth lies in larger and larger volume and lower and lower prices. This policy has been consistently followed by Alcoa.

The reductions in the price since the beginning of the war to 14¢ a lb for pig metal, with corresponding reductions in the prices of semifabricated

By GEORGE J. STANLEY

Vice-president and General Sales Manager Aluminum Co. of America, Pittsburgh

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aluminum should vastly increase postwar markets for aluminum. A view of the price history of the aluminum industry and the present available productive capacity as compared with 1939 may well give rise to the hope that further price reductions will be made.

The second factor that will influence the aluminum market is wider consumer knowledge. Few industries have shown such a tremendous increase in the number of employees as did the aircraft industry and its subcontractors during the early days of the war. Men and women had to be trained to cast, fabricate, form, and assemble the basic aluminum products into useful structures. Manufacturing companies in industries other than aircraft also had to train workers in the use of aluminum. And, since it is only natural to use the material one knows how to work best, this increase in the number of aluminum workers throughout industry should influence the amount of the metal employed in postwar applications.

The third factor is that new fabricating arts have been developed under the pressure of war needs. New joining methods have been proved. New and improved finishes have been made available. New and higher strength alloys have resulted from aircraft needs. These will be ready for peacetime application.

The fourth is the vast amount of metal available. Designers, knowing that large quantities of aluminum will be in the market at the end of the war, can naturally plan for more extensive uses for the metal than they could under prewar conditions. Potential ceilings will seldom be reached, and there will definitely be an adequate supply for any civilian development.

Any consideration of aluminum for postwar use must not only reckon with primary aluminum but secondary aluminum as well. A vast amount of the metal now being used in ships and tanks and planes will eventually return to the market in the form of scrap. While current production figures do not indicate any marked increase in secondary aluminum, it is quite possible that in time the reductions in new aluminum capacity, resulting from the closing of wartime works, will be offset for the first few years after the war by large amounts of scrap aluminum.

In considering the market for aluminum that will be provided by the major industries, transportation promises to be of prime importance. Many large planes intended for conveyance of passengers and cargo are already in the air or under construc-

Materials—Industry's Basic Tools

• • • In viewing the postwar situation in so far as industrial production is concerned, the basic materials from which the various consumer and industrial products are made will be in great supply. The war years opened up vast reservoirs of steel, aluminum, magnesium and the many other basic materials.

All of these basic materials industries are and have been huge in themselves, and their capacity to produce is greater than ever before. Consequently, the disposition of these materials, how they will be used, the extent to which they will be used, factors influencing their application, and their ability to withstand the competition from other materials is of wide inerest.

The postwar position of the aluminum industry is discussed in this symposium by two leaders in the aluminum field, George J. Stanley, vice-president and general sales manager of the Aluminum Co. of America, Pittsburgh, and David P. Reynolds, vice-president of Reynolds Metals Co., Louisville, Ky. Wiser Brown, vice-president and general manager of the American Magnesium Corp., Cleveland, a well known authority in the field of magnesium and its applications, speaks for this material. Thomas E. Lloyd, Pittsburgh Regional News and Technical Editor, THE IRON AGE, gives his views on the position of the steel industry in the immediate postwar years.

tion and even more are contemplated. Indications also point to an increase in the use of medium and light planes carrying from one to five passengers.

Considerable quantities of aluminum will also be used for the construction of railroad equipment. All-aluminum streamlined trains have been in operation since 1934, and their performance has been carefully observed by a number of railroads. In addition to passenger trains and cars, aluminum will be used in freight equipment. Lightweight boxcars, tank cars, and hopper cars, requiring little maintenance will permit either more efficient operation or greater payload.

In the automotive industry, the trend is also toward lightweight aluminum bodies, particularly for trucks and buses. Here, too, the use of this light metal makes possible an increase in payload or in economy of operation. The extensive highway program contemplated by the government will undoubtedly stimulate further expansion of bus and truck transportation which in turn will provide additional markets for aluminum in the automotive industry.

Marine construction will provide another major industrial market for the metal in the postwar years. Substantial quantities of aluminum were used in the construction of our fighting craft and it seems likely that both merchant and passenger ships of the future will make even more extensive use of this metal. Tests have indicated that it is entirely practical from an engineering viewpoint to biuld a ship's superstructure entirely of aluminum and place it on a hull of steel. This method of construction results in a low center of gravity, and makes the ship more seaworthy.

Aluminum lifeboats represent another interesting development. At the beginning of the war about 70 were in service. Not only are boats of this type free from major maintenance problems but they help to lessen the weight of the ship at the point where weight is least desirable, namely on the upper decks. A number of aluminum lifeboats have already been built, and their use will greatly increase when aluminum is more readily available.

In numerous other industries, such as the electrical, chemical, textile, architectural, food, packaging, and paint industries, aluminum was well established prior to the war. Technological advancement, lower cost, and greater availability will stimulate the expansion of these markets to an extent only dreamed of in the past.

Machine Tool Firms Feel Outlook Now Becoming Brighter

Cleveland

• • • Machine tool firms about whom there has been more verbal speculation than the current crop of two-year-olds at Belmont Park, are faced with the pleasant fact that things since V-J Day are looking up. This happy state has been brought about by a general increase in orders, and indications that $32,000,000 now remaining Russian orders are being canceled out or modified. At the same time the Russians are reported to be making other inquiries and apparently buying outside lend lease.

Some of the Russian orders are not being canceled, but are getting hold orders instead. One fairly important order for the Kremlin was ordered held by the Treasury Department, indicating apparently that they expect to reinstate this business through the Export-Import Bank.

Reconversion orders are holding up very well and in at least one case where an order was canceled because of an aircraft cancellation, the manufacturer telephoned a hurried message to the effect that he did not intend to cancel, and please reinstate. He lost priority, of course, but the order was reinstated at a later date, indicating if nothing else at least a definite interest in buying. However, whether this interest is altogether in anticipation of higher production or whether it represents an effort to beat the price increases which appear to be in the offing is difficult to say. In any event, the interest is there.

From the general shape of things it seems that the cancellation peak has passed. It soared in April, vacillated during May and June, and July saw the last of the really heavy cancellations. During August there were relatively few, all of which constitutes solid evidence that the biggest cancellations took place before V-J Day.

Competent observers now believe that the industry will hit peak business in October, with carry-overs as far into the immediate future as December. By that time there will be considerable confusion with boys coming back from the armed forces and a lot of hairpulling in Washington which will serve mainly to frighten many people. Machine tools will then go down with possible recovery in March or April.

Backlogs during the past three trying weeks have undergone little change. Now they are about ready to go up, largely because the shipping rate is low in vacation time. Also, rescheduling interferes with production. Net orders have fallen off considerably and this category, minus cancellations, for July went down under the average for 1939. April, May, June, and July are very low due to the cancellations which were registered in volume, but August should see a net gain and upturn in unfilled orders accordingly, because of low level shipments during the months of July and August.

Regarding the government owned surplus there has been no quantity release of machine tools as yet. Such a release should start soon, however, and come out fast during the next two months. At the present time, it is hard to predict whether the Clayton Formula will prevail if the surplus property people come out with a really large number of machines. Some customers are waiting for this event, but others have gone ahead and ordered new machines and more are following in their wake. These customers have packed up their troubles and stored them away in consideration of the outstanding fortunate factor in the outlook ahead . . . the rapidity with which reconversion is already gone forward.

Hudson on Display

Detroit

• • • Showing of the first 1946 Hudson Commodore 8 was made last week at the plant. The new model is similar to the 1942 car with the exception of a new front end and grille. A. E. Barit, president and general manager of Hudson, stated that the price would be higher than the 1942 model if OPA approval could be secured.

Meanwhile, Henry Ford II, executive vice-president of Ford Motor Co., confirmed that the company plans to more than double its former quota of 39,910 automobiles this year and to quadruple its truck schedule during the coming months of 1945. Ford expects to reach its low point in employment by September 12, thereafter increasing steadily until peak production is achieved early in 1946.

Ford warns however that because of the low flow in parts and the small stock of raw materials strikes among Ford suppliers could easily halt the entire system of production. He said that the steel situation looked brighter every day and could be nearly normal by October or November.

Cast Iron Soil Pipe Price Ceiling Boosted

Washington

• • • An increase of 4 pct or $3 per net ton in ceiling prices for cast iron soil pipe and fittings was announced by OPA on Sept. 6.

The increase under Amendment 4 to RPS 100, becomes effective Sept. 7, and may be passed on to customers by all resellers. The higher price is based on information supplied by the industry that indicates present prices are no longer generally fair and equitable, as a result of recent labor and material cost increases. The increase is authorized for six months only, OPA said, during which period it will conduct a cost survey to determine what general level of prices the cost increases indicate is necessary.

Outline Steps in Labor Dispute Conciliation

Washington

• • • Arrangements for the certification of labor-management disputes from the Dept. of Labor Conciliation Service to the War Labor Board during the interim period just ahead, have been completed by Secretary of Labor Lewis B. Schwellenbach and WLB Chairman George W. Taylor.

WLB has instructed its regional boards to redouble their efforts to decide speedily the approximately 3000 dispute cases now pending which were certified by the Dept. of Labor prior to Aug. 18. The parties involved will be requested to try to settle their cases by direct negotiations under the revised wage stabilization policy which permits more flexibility in working out a mutually satisfactory disposition of wage questions.

In new dispute cases, the regional boards and the Conciliation Service will seek primarily to restore collective bargaining to its normal function, and every effort will be made to resolve these disputes without recourse to further government action. If the parties involved cannot negotiate a settlement, they will be urged to refer the dispute to arbitration where the dispute lends itself to this method of disposition.

If other measures fail, the parties to a dispute should, if they desire further government participation in their settlement, agree to submit to WLB for final and binding determination. Where the parties agree in advance to accept the Board's decision in the case, the Board will accept certification automatically from the Dept. of Labor. The Board recognizes that the Secretary of Labor has the obligation under Executive Order 9599 to certify disputes which might interrupt work contributing to the production of military supplies or interfere with effective transition to a peacetime economy.

WLB has announced that when the Secretary finds it necessary to certify such a case where the parties failed to agree to accept the Board's decision, the Board will work out a procedure adapted to settlement of that particular dispute.

This interim plan will be used until WLB completes its emergency functions and a permanent basis for adjustment of disputes is established.

WPB Lifts Order On Class "A" Products

Washington

• • • Because controls over the production of Class A products in wartime labor shortage areas are no longer necessary, Number 10 was revoked today by the WPB on Aug. 31.

Class A products are those which contain steel, copper or aluminum fabricated or assembled beyond the forms and shapes specified in Schedule I of CMP Regulation 1, other than such steel, copper or aluminum as may be contained in Class B products incorporated in them as parts or subassemblies.

Ceiling Price Set On "Short Orders"

Washington

• • • Establishment of manufacturer's ceiling prices on sales of "short orders" of high alloy castings, was announced by OPA on Sept. 5.

"Short orders," under Amendment 2 to MPR 214 effective Sept. 10, are defined as orders where the shipping weight of the casting multiplied by the quantity ordered does not exceed 75 lb. Prior to this action there was no specific price schedule on these sales of high alloy castings. Ceilings were based on the highest present pound prices provided by the regulation.

The ceilings for high alloy casting are somewhat below those already established for steel, malleable iron, and gray iron castings, because fixed "short order" costs are covered more quickly, OPA said.

"Short order" sales were, generally speaking, made at a loss, OPA said, and this action is designed to help manufacturers of high alloy castings to avoid these losses and to encourage buyers to order castings in quantities in excess of 75 lb.

Strikes Delaying Auto Production

Detroit

• • • Production lines at Ford Motor Co.'s River Rouge plant have been closed down since Thursday as a result of a strike at the Kelsey-Hayes wheel plant. 3100 Ford assembly workers are affected by the action of 4500 employees of the plant producing wheels and brake drums for passenger cars and trucks.

Ford's Canadian plant is also threatened by a strike, although negotiations for a settlement were still under way early in the week. A strike vote had been taken over the week end, with a majority of workers favoring the action.

Meanwhile, production at the Hudson Motor Car Co.'s plant was halted after the walk-out of 500 foremen, members of the Foremen's Assn. of America.

Fedders to Vote On Possible Stock Split

Buffalo

• • • The Fedders Manufacturing Co. has called a special meeting of stockholders for October 16 to vote on a proposal for a five-for-one split-up of the common stock. Each share of $5 par stock would be exchanged for five shares of $1 par under the plan. The company has 240,000 shares outstanding. Plans to list the issue on the New York Stock Exchange are reported under way.

Directors declared a quarterly dividend of 37½ cents a share, payable October 10th to stockholders of record September 20th.

Olin Consolidates Brass Mill Facilities for Postwar Market

East Alton, Ill.

• • • Olin Industries, Inc., has recently consolidated all of its brass mill business into a division to be known as Western Brass Mills. The opportunity to coordinate the production and marketing phases of the Western and Winchester brass mills followed the formation of Olin Industries, Inc., as an outgrowth of the merger of Olin Corp. and Western Cartridge Co.

The production facilities serving in the consolidated division are the brass mills at East Alton and at New Haven, Conn., in connection with other divisions of Olin Industries, the Western Cartridge Co. at East Alton and the Winchester Repeating Arms Co. at New Haven.

Marshall W. Acker, former general manager of East Alton operations, has been appointed director of the new division. He will be assisted by a complete technical and sales organization with headquarters at East Alton, resident technical and sales staffs at New Haven and a network of branch sales offices in the principal manufacturing centers of the country.

Behind the wartime production of more than one and a half billion pounds of cartridge metal at the East Alton mill lies a background of record production at the St. Louis Ordnance Plant, operated by the United States Cartridge Co., another Olin Industries subsidiary. When this ordnance plant was proposed early in 1940, the management of Western Cartridge Co. questioned the adequacy of existing brass mill facilities to provide sufficient cartridge metal and other essential alloys for continuous operation. Recalling their experience in World War I, when Western was forced to install its own brass mill, the brass strip capacity of East Alton mill was expanded by management to meet the major needs of its subsidiary.

Thus, Western undertook the production of brass requirements for ammunition plants at East Alton and New Haven and the new small arms ammunition colossus in St. Louis. Capacity for the latter was added to the East Alton mill. At the peak of cartridge production in 1943, St. Louis employed 34,300 workers, and East Alton had expanded to 13,500—nearly 50,000 ammunition makers depending on Western's East Alton brass mill as the principal source of metal supply.

The combined production of the St. Louis and East Alton plants exceeded 12.5 billion rounds of small arms ammunition as of June 30, and the task of providing cartridge metal for this production caused Western's East Alton mill to become the largest single producer of brass strip in the country.

While the East Alton mill was breaking records as a producer of strip, the New Haven mill produced other brass requirements of the Winchester ammunition manufacturing operation and turned out other essential products. One outstanding Winchester product was tubing for cartridge-core radiators, widely used for liquid-coled aircraft motors. Both mills manufactured metal parts for fire control equipment and many other critical items for the Army and Navy.

Western became a producer of brass during the first World War in order to supply its needs for the manufacture of small arms ammunition, and entered the commercial brass business one week after the Armistice. In 1931, with the purchase by Western of the Winchester Repeating Arms Co. of New Haven, the Western Cartridge group acquired its second brass mill. The New Haven mill, in operation since 1883, had confined its production largely to cartridge metal for Winchester's own requirements. Following acquisition by Western, its facilities were expanded, including new equipment for the production of flashlight case metal for the Winchester and Bond Electric brands.

With the outbreak of the war, brass mill facilities at New Haven again were increased—this time to include improved processes and equipment developed by Western at the East Alton mill.

Now John M. Olin has succeeded his father, Franklin W. Olin, the founder, as president. Spencer T. Olin, another son, has become first vice president.

WESTERN BRASS: *A section of the East Alton mill with modern hot mill equipment in the foreground. A slab of metal is just entering the guides.*

Canada's Reconversion Being Pushed But Temporary Unemployment Continues

Toronto

• • • Canada's reconversion program is being pushed forward with a minimum of delay, but the swing from war to peace production has not been sufficiently advanced to take up the full load of unemployment despite announcements from Government sources that there are more jobs in the country than workers to fill them.

Most war contracts now have been cancelled, with announcements during the past week or ten days regarding almost total suspension of all aircraft production for war purposes. In the Toronto area alone, approximately 10,000 persons have been given notice by the aircraft industry, and correspondingly large layoffs have been reported in the Montreal area.

Surplus of workers now is reported for Montreal, Quebec, Windsor, Fort William, Winnipeg, Victoria and Vancouver, while the stoppage of work in aircraft plants may soon bring Toronto into this group. The trades and industries that report labor shortages at this time are mining, lumbering, building and construction and similar other heavy working propositions. The steel industry also reports labor shortage both in skilled and unskilled departments.

Insofar as manufacturing activities are concerned there is no labor shortage at the moment, although many industries will take on additional workers as soon as plants are made ready for full peacetime production schedules.

Certain industrial leaders predict a surplus of labor to the end of this year, with a sharp pick up in employment early in 1946, by which time most industries will be retooled and in full production of consumer goods for domestic and export markets. Dozens of new industries, both from the United States and Europe will be established in Canada and already a large number have started negotiations on this account.

To provide space for small industries many government owned plants are to be remodelled and leased for this purpose. It has just been announced that the government owned part of the deHavilland aircraft plant at Toronto, will be sold to a private company which will give employment to about 1000 workers.

The automotive industry will be one of the first industries in Canada to attain all-out civilian production. At the present time wartime assembly lines are being taken down and being replaced by equipment for peace-time operations. It is estimated that the 1946 production will reach a total of 200,000 cars.

Railroad equipment makers also are operating at virtual capacity, on domestic orders and orders for export. Announcement was made this week that National Steel Car Corp., Hamilton, has received an order from the Canadian Pacific Railway Co., for 75 steel air-operated dump cars of 70 tons capacity.

The Canadian steel industry is maintaining production to the limit of its labor supply. The Steel Co. of Canada Ltd., Hamilton; Algoma Steel Corp., Sault Ste. Marie; and Dominion Steel & Coal Co., Sydney, all report backlogs extending well into 1946 and limited additional capacity available to the end of this year.

Despite war cancellations for steel, there has been no lay-off of workers at the steel plants, and production schedules are being maintained. It is pointed out that civilian buying is developing in increasing volume and demand on this account is more than sufficient to absorb all loss of business through the drop in war orders.

Dominion Foundries & Steel Ltd., Hamilton, reports that all direct war contracts have been cancelled but civilian demand has kept operations at the capacity allowed by labor supply. Construction of the $1,200,000 cold roll mill is proceeding, and the new unit is in partial production.

The only handicap to all-out civilian production at this time is the necessity of retooling by practically all plants that were on war production, and the obtaining of adequate raw materials, especially steels.

ANNEALING BRASS: *East Alton mill. The operator is charging coils of metal into six furnaces. Equipment has been standardized at New Haven and East Alton mills so that products can be sent from either to supply customers' requirements.*

Additional Revocations

M-360 — Aircraft component scheduling.

L-60—Limitation on the sale of 38 caliber revolvers and 12 gage shot guns.

M-1-L—Established reporting procedures for the aluminum industry.

Price Controls Relaxed On Many Industry Items

Washington

• • • Confirming earlier announcement by Administrator Bowles, the OPA suspended price controls on primary aluminum ingot, pig aluminum, magnesium scrap, primary and secondary magnesium and most aluminum castings, magnesium castings and die castings on Aug. 29.

However, controls still remain in effect on scrap and secondary aluminum, OPA emphasized, and the suspension does not apply to aluminum and magnesium mill products such as strip, sheet, tube or rod.

Controls were suspended, OPA said, on aluminum and magnesium castings covered by MPR No. 125. These types have been going largely into military items that are no longer required.

Price control suspensions on the following items were also announced by OPA:

1. Clockwork systems, industrial.
2. Army tank engines.
3. Furnaces and ovens, industrial and laboratory (except space heating, warm air furnaces, stoves, blast furnaces and industrial furnaces and ovens used safely for the manufacture of coke, pig iron and steel, or used for food processing).
4. Heating, melting, burning and thawing equipment, portable for industrial and transportation uses, excluding fire pots and blow torches.
5. Gages, standard industrial and special purpose, including plug, ring, snap, height, length and location gages, but not testing machines.
6. Gyroscopes.
7. Marine instruments.
8. Numbering and marking machines for use on metal, except office machines.
9. Optical processing machinery, manufacturers', except RX optical and laboratory machinery.
10. Pipe wrapping and coating machinery.
11. Architectural and engineering reproduction machinery such as blue printing, brown printing and white printing, but not photographic process machinery.
12. Steam engines, except railroad locomotives.
13. Searchlights, military, completely assembled.
14. Spring winding and wire forming machinery and equipment.
15. Marine equipment covered by OPA's price regulation for machinery.

The following items have been exempted from price control:

1. X-ray equipment and supplies, exclusive of tubes.
2. Broom sewing machines.
3. Bust forms and fillers (other than surgical bust forms and fillers).
4. Architectural dimension stone, monuments and memorials.
5. Lighting fixtures designed by architects, builders and decorators for installation in a particular setting.
6. Bi-metallic strips used as the actuating part of various automatic gages, switches and controls.
7. Voting machines and parts.

Engineering Data On Seamless Tubes Ready

Pittsburgh

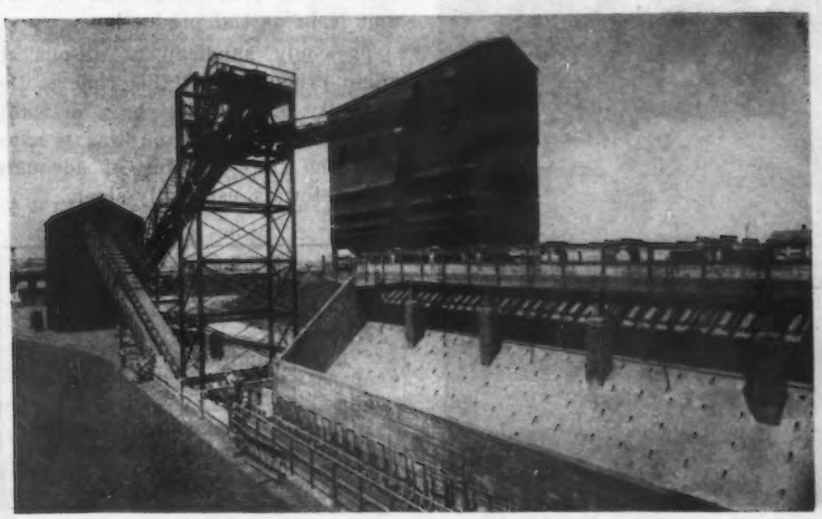
• • • Seamless tubes are as old as the hills, or at least as the jungles, for Nature created them in the form of bamboo and in the bones of animals and birds.

It took several thousand years for man to catch up with nature in the adequate use of this design element. It was not until 1887 that the art of seamless steel tube making began to make itself apparent. Since then it has blossomed and multiplied until today seamless mechanical and pressure tubing are extremely valued elements in the designer's list of available structures, particularly where lightness and strength are desired in combination or where internal pressures must be withstood. Today one can secure mechanical or pressure tubing made by the seamless process in an almost unlimited range of size, shape and surface finish and with varied physical characteristics depending upon the alloy content.

A valuable reference book on this subject has been completed and published by the Seamless Steel Tube Institute here. It is a veritable mine of information for the designer and engineer. Data are included as to sizes, weights, characteristics shapes and compositions of seamless drawn tubing of nearly every known variety. In addition, its more than 300 pages contains a most interesting account of the development of the art and of modern methods of production.

The book is gotten up in loose leaf style to accommodate additions to this record of an expanding art and is bound in a substantial loose leaf cover; available for $2.50 per copy from the Seamless Steel Tube Institute, Gulf Building, Pittsburgh.

SLAG AGGREGATE: *The Celotex Corp. at the DPC-owned South Chicago Plant of Republic Steel Corp. has begun expanding slag aggregate production. The company now has five plants and is anticipating construction of others as soon as conditions permit.*



Surplus Sales Realize 50 Pct

New York

• • • Sales of surplus machinery in the New York regional area of the Reconstruction Finance Corp. between April, 1944, and Aug. 15, 1945, brought more than 50 pct of the original cost of such goods.

Sales totaling $7,721,519 compared with cost of $13,599,461. Total value of surplus machinery and machine tools declared to the regional office during the period—including some pieces dating back to the Spanish-American War—aggregated $26,853,781.

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Cold drawn and bright finished, accurate to size, with qualities and properties that save you money in the machining and manufacture of parts and products. Our metallurgical engineers will be glad to discuss your production problems with you.

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Industrial Briefs . . .

• STORAGE SPACE — The Reconstruction Finance Corp. announced that it has contracted with the American Radiator & Standard Sanitary Corp. for purchase of the latter's building in Elmwood Ave., Buffalo, now occupied by the Bell Aircraft Corp., for $2,150,000, to be used for the storage and disposition of surplus war material.

• ACQUIRES STEEL RIGHTS—All patent rights to a new platinum thermocouple, providing practical and accurate results in measuring molten steel temperatures, have been acquired by the Brown Instrument Co., Philadelphia. The rights, covering manufacture and sale, were acquired from the Rustless Iron & Steel Corp.

• GM ADDITIONS—Ground has been broken for the first of three large buildings which will be added to the plant of GMC Truck & Coach Div. of General Motors, Pontiac, Mich. Work will start soon on a new two-story engine plant and a new engineering building. The new plants will make possible an annual coach volume of about 4500 as compared with the best previous year of 2400 units.

• ASSEMBLY PLANT — General Motors Corp. has bought approximately 250 acres at Doraville, Ga., near Atlanta, for possible use as a Buick, Oldsmobile or Pontiac assembly plant.

• BUYS BUSINESS — Menasco Mfg. Co., Burbank, Calif., has bought the business and assets of Malabar Machine Co., Los Angeles, maker of hydraulic jacks.

• PLANT CLOSES—The government-owned aluminum sheet plant at McCook, Ill., near Chicago which has been operated by the Aluminum Co. of America, closed indefinitely Aug. 31 pending formulation of operating or disposal policy.

• PLASTICS PLANT — The War Production Board has authorized the construction of a $4,706,204 laminated plastics plant at Coshocton, Ohio, by the General Electric Co., Pittsfield, Mass. The finished plant will occupy 285,000 sq ft, a mile south of the city.

• TRACTOR OUTPUT — Along with continuing tank production, the Massey-Harris Co., Racine, Wis., is producing almost 400 tractors a week. The company has plans for two new farm implements, a forage harvester and a self-propelled corn picker. Production plans include conversion of the company's 33-acre tank plant in Racine to production of tractors and tractor mounted implements.

• ON THE MARKET—The Timken Ordnance Co. plant Canton, Ohio, has been offered for sale or lease by the RFC. The RFC has also announced the DPC plant operated by Timken at Columbus, Ohio, was on the market.

• NEW LAB — Approximately $170,000 is being spent by Heppenstall Co., Pittsburgh, for the construction and equipment of a new research laboratory. The laboratory will be housed in a two-story brick building directly opposite the company's plant.

• NEW DIVISION — The Cooper Alloy Foundry Co., Hillside, N. J., has established a sub-division devoted exclusively to precision casting of small intricate parts.

• NEW TEST LAB—Construction of a new test laboratory to cost $750,000 and greatly extending the facilities of the Research Engineering Div. of the Elliott Co., Jeannette, Pa., has been announced.

• NEW PLANT—Wyman-Gordon Products Corp., Grafton, Mass. plant will start operations around the first of the year. The plant will turn out magnesium and aluminum press forgings for the aircraft industry. It will cost $3,500,000, and has an 18,000-ton die forging hydraulic press.

Reimbursement Steps; Victory Holiday Pay

Washington

• • • Contractors may be reimbursed for salary payments made to employees for work performed on Aug. 15 and 16, according to Regulation No. 20 of the Office of Contract Settlement.

As directed by President Truman on Aug. 25, amounts may be included in the settlement of terminated contracts for payments made to employees, including premium payments required by the applicable provisions of law or Executive Order 9240.

Amounts may be included in the settlement of terminated contracts for payments made to employees for time off on Aug. 15 and 16, the OCS ruled, in accordance with the following principles; (1) Such payments shall not exceed pay for a normal shift at straight time rates, (2) Payments shall be included in the appropriate overhead accounts of the contractor and allocated between the terminated work and other work in accordance with accepted commercial accounting practices.

For the purpose of bringing about a reasonable allocation of such payments, the accounting period customarily used by the contractor for the distribution of overhead may be shortened but not to a period of less than one month in the absence of clear evidence of special circumstances creating unfairness.

Rustless Expansion To Include Five Projects

Baltimore

• • • Continuing a program of expansion which was interrupted by outbreak of the war in 1941, the Rustless Iron & Steel Corp. has announced a series of five building projects to cost approximately $2,440,000.

The five projects are (1) relocation and improvement of present hot rolling facilities in order to produce a larger variety of sizes of stainless steel rods, at a cost of $1,370,000; (2) rearrangement and enlargement of the cold rolled shape mills, costing $400,000; (3) a five-bay addition to the inspection and shipping department, costing $400,000; (4) revamping of the power sub-station and the purchase and installation of additional electrical switch gear, at a cost of $218,000; and (5) installation of a new water-reclaiming system at a cost of $55,000.

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S-5

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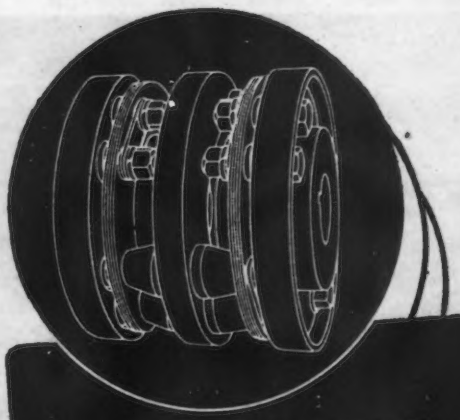

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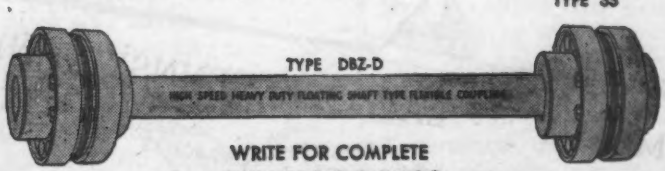

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Construction Contract Awarded for Plant

Cleveland

• • • **Construction contract** for the new semi-works plant of the B. F. Goodrich Chemical Co., at Avon Lake, 15 miles west of Cleveland, has been awarded to John Gill & Son, Cleveland, it is announced by William S. Richardson, chemical company president. Cost is to be around $600,000.

Designed as a versatile small-scale chemical plant which can easily be converted to a variety of processes, it will be used to develop manufacturing routines for new synthetic resins and chemicals. New adaptations of the company's line of Geon polyvinyl chloride resins will be processed here, as the intermediate operation between the pilot plant of the laboratory and full-scale commercial production. The new plant is needed because facilities for this type of activity have been over-taxed by war demands, to which most of the company's production is devoted.

The process building is the largest of the three structures in the plant group. It is 50 x 120 ft, three stories of steel frame covered with composition siding. Utility building will be one-story, 50 x 140 ft; will house laboratory, machine shop, offices and lockers, eventually will be devoted entirely to laboratories.

WLB Approves Modest Midwestern Wage Adjustments

Chicago

• • • **Wage adjustments** at the Motor Castings Co., West Allis and Milwaukee, have been approved by the sixth Regional WLB. The board approved a 3c an hr increase of day rates, a three pct increase of piece work rates for five job classifications, a rate of 65c an hr for watchmen and a rate of 60c an hr for children 18 yr of age or under. Also approved was a premium pay of 5c an hr for the night shift and a hiring rate schedule.

At the A. O. Smith Corp., St. Paul, Minn., the board approved 12 min paid lunch period for employees working in departments which are on a three-shift basis, vacation schedules, and piece work rules. Denied were the wage rate increase proposed for janitors and sweepers, and increase proposed for tractor mechanics, and automatic length of service increases proposed for non-production shop workers.

It is reported that . . . . . .

A mathematical method for exactly determining the shapes of cams has been worked out by two university professors. *Carver & Quinn, Cornell Univ.*

get ready with CONE for tomorrow

Reverse-cycle heating is in actual use. In principle it consists in taking heat from the outside air (even the coldest air has some heat in it) and concentrating it for use indoors. Even better results may be had by using the heat in ground water from deep artesian wells. Where electricity is cheap, it seems to be a practical method as the only cost is the operation of the pump. *Science Digest.*

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Plastic records used in a new electronic dictation machine are claimed to be so thin and flexible that they may be folded and mailed. *Sound Scriber Corp.*

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A new method of spraying airplane "dope" uses heat instead of thinner to liquefy the material. *Sherwin-Williams.*

get ready with CONE for tomorrow

One city is investigating the possibility of an 8-mile subway in which passengers would be carried by an endless conveyor belt. *Detroit.*

get ready with CONE for tomorrow

Water, nearly equivalent to distilled water in purity, may now be produced by passing through filters made of synthetic resins. After continued use, the filters may be renewed by flushing. *Resinous Products Chemical Co., Philadelphia.*

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One of our airlines plans to inspect its planes by X-ray at 750 hour intervals in order to reveal hidden weakness or failure. A portable X-ray machine will be used and 4 to 5 days will be required to take the 352 shots believed to be necessary. *Air Transport.*

One factory, serving 18,000 meals per day, believes that the day of the lunch pail is over. *Sperry Gyroscope.*

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One of the largest printing press manufacturers announces a postwar press to produce newspapers with 4 colors on all pages. *R. Hoe & Co., Inc.*

get ready with CONE for tomorrow

High-nickel alloy tubes can now be made in sizes up to 11 in. diameter by extrusion. *International Nickel.*

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A new high speed motion picture camera takes 8,000 pictures per second. When projected at normal speed, the result is a slowdown of 500 to 1. *Bell Telephone Laboratories.*

Chemists expect that fish may become more important as a source of industrial chemicals than as food. Already substances have been isolated that appear to be useful in paints, inks, lacquers, plastics, photographic papers, adhesives and medicines. *Business Week.*

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A Cuban inventor has received a patent for the production of alcohol by continuous flow. *Patent 2,371,208.*

get ready with CONE for tomorrow

A method is reported for making synthetically optical crystals far larger than any produced by nature. *Polaroid Corporation.*

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Permission has been granted to build a station for color television experiments. *Zenith Radio.*

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A large manufacturer of railroad cars expects that 27,000 of the country's 30,000 railway passenger cars will have to be replaced after the war. *Pullman-Standard.*

UNUSUAL CASTINGS FOR UNUSUAL SERVICE...

ABSCO-MEEHANITE

delivers long cam wear in close tolerance work

A large manufacturer selected Absco-Meehanite castings from which to make Swiss type screw machine cams — after trials which included cast iron and steel plates. The service called for — and received — the kind of performance to be expected of hardened tool steel.

From the rough blanks furnished by Absco-Meehanite (Fig. 1), successive operations include finishing the flat sides (Fig. 2), drilling the centers, laying out cams on the blanks, rough machining, flame hardening and finish grinding to tolerances of several ten thousandths of an inch. The cam illustrated in Figure 3 was photographed after 200 hours of service under the same screw machine operating conditions which caused a cam other than Meehanite to show wear after 30 hours.

The combined properties of wear-resistance, rigidity and machinability were illustrated in the Absco-Meehanite cam's leadership along with a special ability to undergo flame hardening without distortion. (It is hardened to 53 to 55 Rockwell C scale.)

Among the four classifications and twenty-one types of Meehanite, there is probably a metal whose controlled physical properties afford the special combination of characteristics your work demands. Inquiries are welcomed by Absco-Meehanite engineers.

ABSCO-MEEHANITE PROPERTIES

1. Strength (Shear, Compressive, Tensile and Transverse)
2. Impact Resistance
3. Corrosion Resistance
4. ✓ Wear Resistance
5. Heat Resistance
6. Toughness
7. ✓ Rigidity
8. ✓ Machinability
9. Pressure Tightness
10. Vibration Absorption

Meehanite castings permit close control of physical properties for your specific application. Write for Meehanite Engineering Handbook

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BRAKE SHOE AND CASTINGS DIVISION
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Alabama Job Future Sees 24 Pct Increase

Birmingham

• • • A survey of 2700 of Alabama's larger business and industrial firms indicates that full peacetime employment in the state should exceed by 24 pct that of 1940, Thomas W. Martin, state chairman of the Committee for Economic Development announced.

The CED chairman also made the following observations:

"Future industrial activity as indicated by the survey suggests an optimistic viewpoint. True, there will be a period when there will be some degree of localized unemployment. This will be notably true in areas where there was a mushroom growth of primarily war industries.

"Much of Alabama industry, however, can readily convert to peacetime production. In fact, some of it has already reconverted; notably the steel, cast iron pipe, coal, paper and lumber industries . . ."

Scrap Committee Formed

Washington

• • • Members of the Special Industry Advisory Committee formed under auspices of the War Department for the purpose of studying ferrous and non-ferrous scrap problems and making recommendations on future disposal policies, (THE IRON AGE, Aug. 23, page 109) are:

Robert Wolcott, president, Lukens Steel Co., Coatesville, Pa.; L. D. Green, Bethlehem Steel Co., Bethlehem Pa.; N. Ebersole, American Rolling Mill Co., Middletown, Ohio; Carl A. Ilgenfritz, Republic Steel Co., Cleveland; Joel Claster, vice-president, Luria Bros., Philadelphia; Moris Schapiro, Boston Iron and Metal Co., Baltimore; J. B. Neiman, president, Federated Metals Division of American Smelting and Refining Co., Detroit; Edwin C. Barringer, president and executive secretary, Institute of Scrap Iron and Steel, Washington, D. C.; H. Dewitt Smith, mining engineer, New York; William G. Dross, executive vice president, Scovill Manufacturing Co., Waterbury, Conn.; Walter Hoeschild, vice president, American Metal Corp., New York; Carl T. Hieme, vice president, H. Kramer & Co., Chicago.

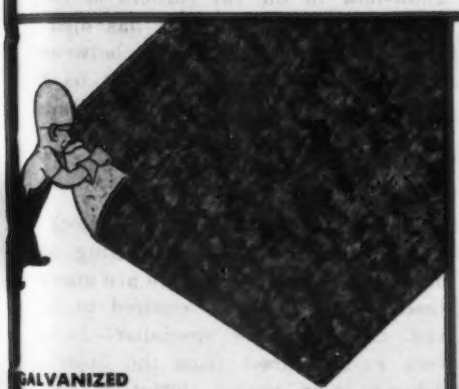
Chicago Area Output Trebled

Chicago

• • • With a 45 pct increase in the dollar value of its industrial facilities since 1939, the Chicago industrial area almost trebled its output of goods which rose to $11.9 billion in 1944 from $4.3 billion in 1939, according to Chicago Association of Commerce. Production in the area was at an annual rate of $11.1 billion when the Japanese asked for peace, a drop of $800 million from the 1944 record high annual rate.

THIS IS THE DAY OF THE SPECIALIST

Modern production has no place for *jack-of-all-trades* steel sheets. In men and materials, this is the day of the specialist. That's why Continental Steel Corporation and its subsidiary, The Superior Sheet Steel Company, produce steel sheets in more than thirty different kinds of surface treatments, finishes and coatings, in a wide range of specifications. Continental sheets are made to meet manufacturer's particular needs, especially well. (See below.) For complete information about Continental and Superior steel sheets, write or wire today.



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A bright-spangled, commercial galvanized sheet with exceptionally good working qualities. Soft and uniform.

GALVANNEALED

A special quality steel sheet that takes and holds fine finishes. Rust resistant. Easily fabricated, easily soldered.

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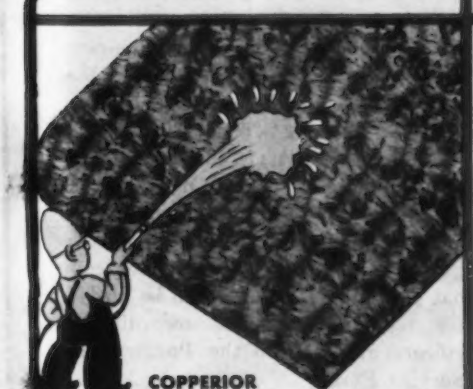
A favorite with manufacturers. Open hear steel base, tempered for accurate formin Takes paint, resists rust.



COPPERIOR

Copper steel base gives greater resistance to corrosion. A fine sheet for workability and bright clean spangle.

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Galvanized by the Superior process with bright, checkered spangles. Pleasing to look at, fine to work with.

LASTIKOTE

Galvanized sheet made especially to tal severe forming without fracture of the coa ing. Has a brighter finish.

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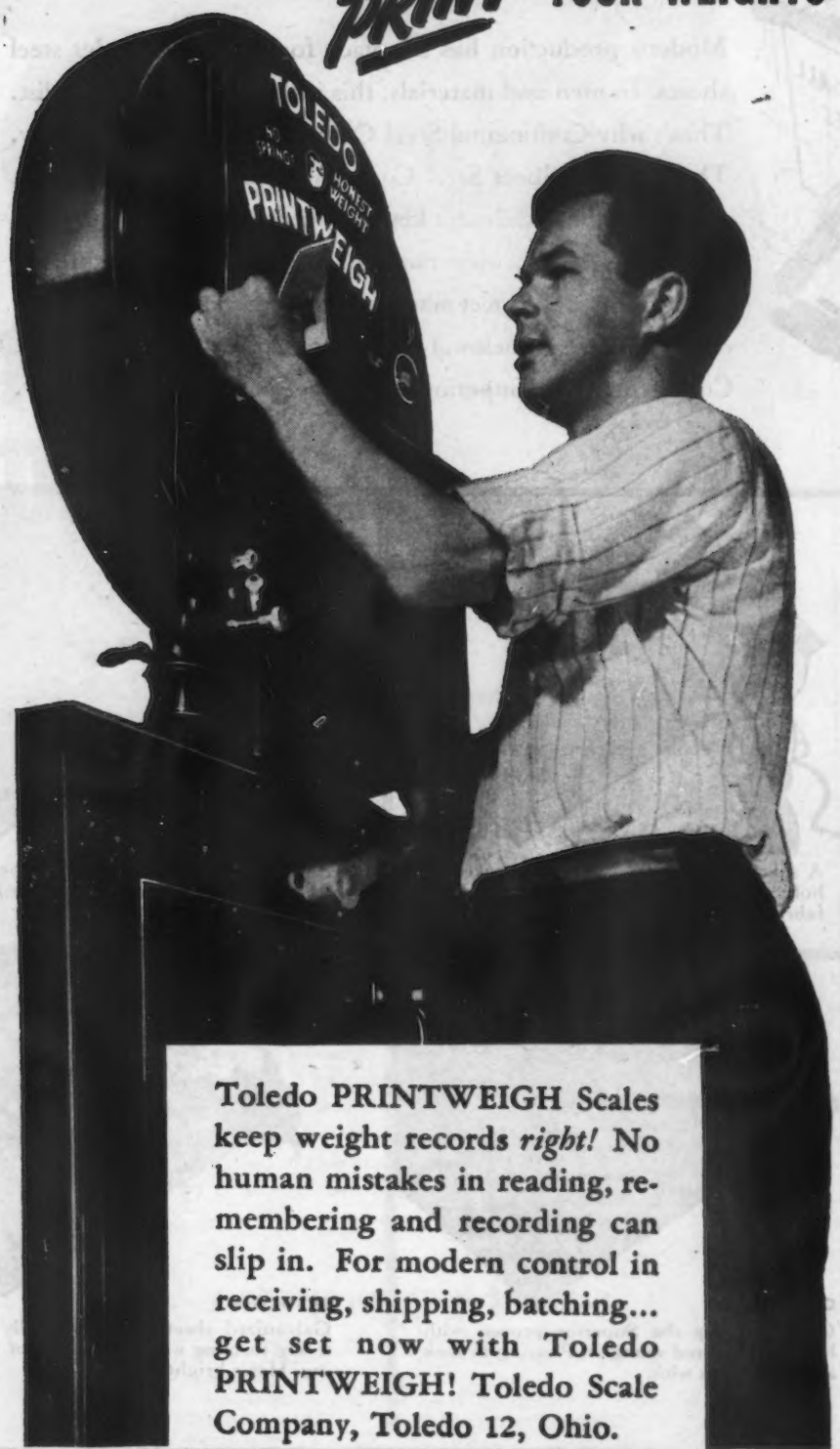


Toledo PRINTWEIGH Scales keep weight records *right!* No human mistakes in reading, remembering and recording can slip in. For modern control in receiving, shipping, batching... get set now with Toledo PRINTWEIGH! Toledo Scale Company, Toledo 12, Ohio.

TOLEDO

HEADQUARTERS FOR SCALES

Industry Technicians Form Integral Part Of Navy Operations

Washington

• • • **Johnny-on-the-spot** service will continue to be rendered by hundreds of industry technicians throughout the Pacific ocean areas, despite the war's end. These men who during the war provided contact between the Navy and industry will play a part in the Navy's partial demobilization as well as the maintenance of the postwar fleet, according to present Navy plans.

More than 3000 of these men, drawn from the ranks of American industry from vice-president to master machinist, have spread American know-how to the far corners of the globe, wherever the Navy has operated. Providing cooperation between Navy personnel and industry back home, from Pearl Harbor to within 80 miles of Tokyo, these men have helped keep the fleet in top fighting form.

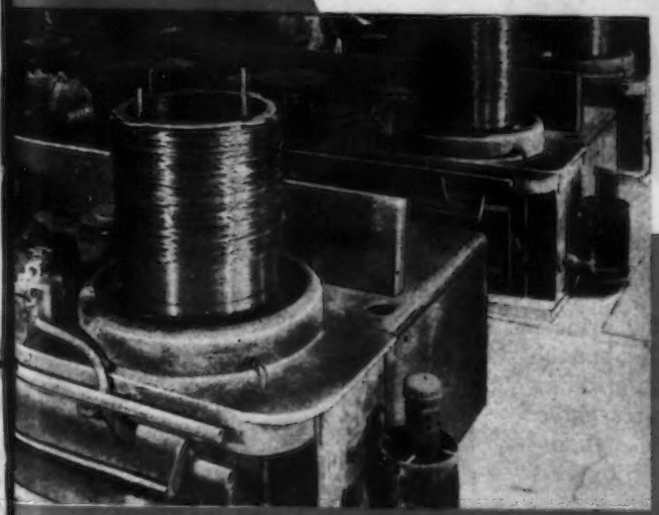
The primary function of these technicians comes under the heading of maintenance, although there are many special jobs they are required to do and in some cases specialists have been rushed direct from the States. Among their varied duties is the training of the men who have to live with the equipment in question, aboard ships and at shore stations. Obviously, these sailors will come home with a knowledge of machinery, metals, design and maintenance that will help toward keeping America industrially strong. Tens of thousands of sailors, drawn from all walks of life, have learned new methods and techniques in industrial operation by actually doing the work, under the guidance of a technician, under combat conditions. There could be no better teaching methods, according to officers attached to the Pacific Fleet Service Force.

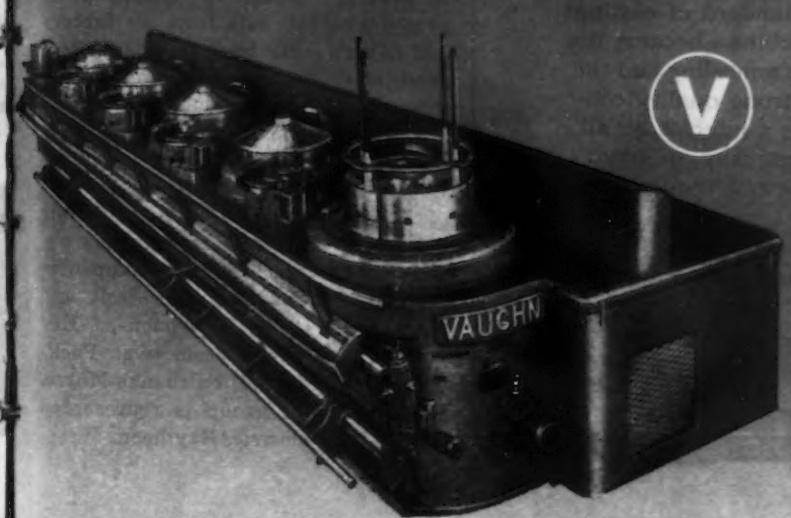
While maintenance will still occupy a large part of their time, the most important postwar task facing the technicians will be that of familiarizing the men of the Fleet with the latest in American industrial developments. Keen competition is expected in supplying the Navy with new methods and machines and it will be vitally necessary to have the proper instruction in installation and maintenance available to Navy personnel in faraway bases.

In November, 1943, a directive was

Dependable PRODUCTION

from the
largest BARS
and TUBES . .
. . . to the
smallest WIRE





Vaughn Cold Drawing Equipment

Bars, special shapes, tubes, wire, heavy or fine . . . in steels, alloys, non-ferrous metals for all applications . . . there's a Vaughn Machine for each job, faultlessly engineered, precision built, with durability for years of capacity operation. ● Have a Vaughn representative furnish expert counsel on your production requirements now in the making!

THE VAUGHN MACHINERY COMPANY
CUYAHOGA FALLS, OHIO

COMPLETE COLD DRAWING EQUIPMENT . . . Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.

issued by the Navy Department establishing uniform policies for accrediting civilian technicians. Prior to this time technicians were operating with the Navy, but there was no central coordination. Under present regulations technicians are provided with transportation and are treated as officers wherever possible. They wear standard Navy officer uniforms without any insignia of rank. A special insignia has been established for technicians. Actually, they are neither civilian nor military. They are not paid by the Navy, but by their companies.

Although some original procurement contracts call for maintenance of equipment for a definite period of time, requiring the services of a technician, most technicians operate under special contracts whereby the Navy contracts with the company for the services of a technician and reimburses the company.

Technicians serve aboard service and combat ships, at shore bases, air stations, and have even gone in on invasions. Several technicians have been pinned to the beach during the initial stages of an island campaign. In this case they were needed to keep special equipment in operating condition.

In most cases technicians are requested by individual area commanders, who cite their problem and experience and the ability required to solve it. Sometimes within a matter of days this man is on his way from Pearl Harbor or Guam, or the United States.

On several occasions the Navy Department in Washington wanted to know how particular pieces of equipment were functioning and technicians were dispatched to fill this need.

Generally, the technician is a man who had considerable to do with the development of the item on which he is working. Under the theory he is armed with full data from his factory and in turn sends back reports on field conditions. Modifications are then put into effect at the producer's plant.

The Bureau of Ships still has more than 500 industry technicians in the Pacific area. Most of them are divided between diesel and electronic equipment. The diesel group has obtained its technicians from companies such as General Motors Detroit and Cleveland Diesel Divisions, Hill Diesel, American Locomotive, Packard, Chrysler, and Fairbanks-Morse. The electronics group is represented by Western Electric, Raytheon, West-

Clean Castings *save money...*

STRONG TAKES the same well earned pride in its cleaning operations that it has for its annealing facilities. In addition to the cutting, grinding and chipping processes, Strong operates three sandblasts with the larger one capable of handling any casting which comes from its 15 by 19 foot annealing furnace.

All of which adds up to a standard of castings which are much easier to machine—because the steel making, the molding, the annealing and the cleaning are all handled by Strong quality controls that safeguard the buyer's interest at all stages of the work. The surest way to have stronger castings is to have them Strong-cast!

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TENSILE STRENGTH · ELONGATION

HEADLINES OF TOMORROW—

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HIGH STRENGTH LOW ALLOY STEELS

IMPROVED PHYSICALS

MORE FOR YOUR MONEY

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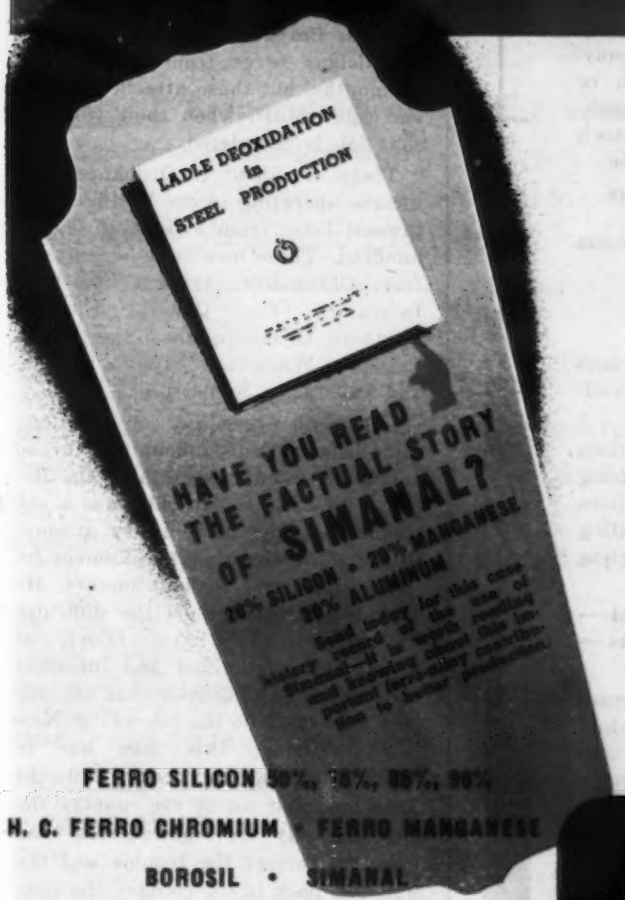

and OHIO FERRO-ALLOYS CORP. HELPS PRODUCERS MEET THE CHALLENGE

Cost and quality control are basic to successful peace time iron and steel production. Your practice in making ferro-alloy additions can be improved, quality and steel yield increased, with lower costs and gain in complete customer satisfaction.

Right now is an excellent time to investigate your ferro-alloy consumption and consult an Ohio Ferro-Alloys representative. You'll find "production and cost minded" assistance available.

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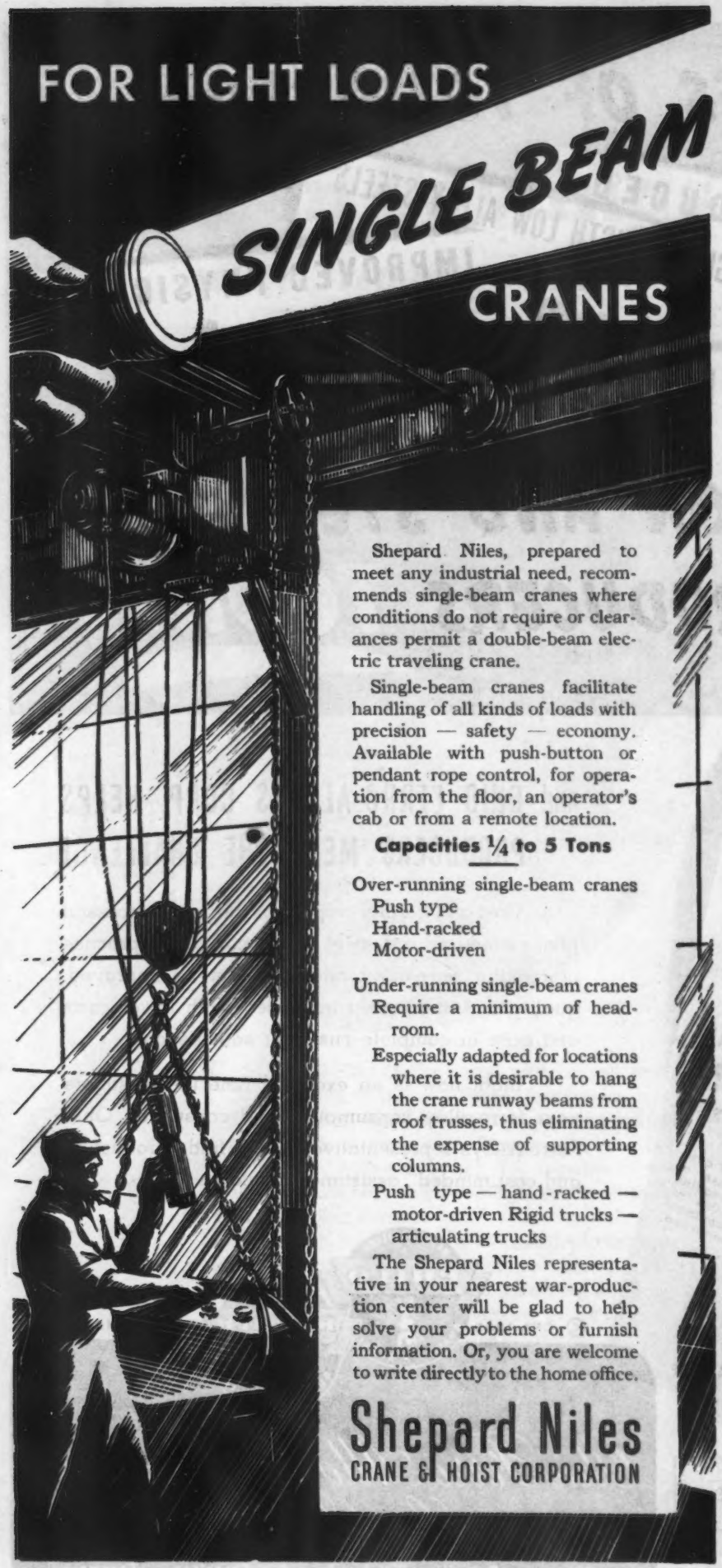


Shepard Niles, prepared to meet any industrial need, recommends single-beam cranes where conditions do not require or clearances permit a double-beam electric traveling crane.

Single-beam cranes facilitate handling of all kinds of loads with precision — safety — economy. Available with push-button or pendant rope control, for operation from the floor, an operator's cab or from a remote location.

Capacities ¼ to 5 Tons

Over-running single-beam cranes
Push type
Hand-racked
Motor-driven

Under-running single-beam cranes
Require a minimum of headroom.

Especially adapted for locations where it is desirable to hang the crane runway beams from roof trusses, thus eliminating the expense of supporting columns.

Push type — hand-racked — motor-driven Rigid trucks — articulating trucks

The Shepard Niles representative in your nearest war-production center will be glad to help solve your problems or furnish information. Or, you are welcome to write directly to the home office.

Shepard Niles
CRANE & HOIST CORPORATION

356 SCHUYLER AVENUE • MONTOUR FALLS. N. Y.

inghouse, RCA, and General Electric, among others.

Problems they are called upon to solve are varied and range from those involving simple mechanics to metallurgical puzzlers. One of the more recent problems concerns the persistent failure of chrome plating on diesel engines in the Pacific. The problem had been passed on to the manufacturer who had studied and reviewed it. At the present time a technician is on the scene, studying the problem.

In another case involving a particular locality in the Pacific, constant failure of piston rings on diesel engines was reported. The technician assigned to the job made studies of the engines and found them scorched. He checked the oil and found the first batch satisfactory. In two or three others he found that salt water had been seeping in, due to improper caulking. This was diluting the oil rapidly and after a new caulking job had been done this trouble disappeared.

In the Bureau of Ships maintenance technicians serve from one year to 16 months, but those attached to special jobs return when their work on that job is completed.

There are about 40 Ordnance technicians operating in the Pacific at the present time, from a peak of several hundred. These men have been drawn from Oldsmobile, Arma Corp., Ford Instrument Co., General Electric, Northern Ordnance, Inc., Sperry Gyroscope, Waterbury Tool, Vickers, and Submarine Signal Co.

One of the speediest jobs ever accomplished by a technician was turned out under the sponsorship of the Bureau of Ordnance. In this case a sub commander had made every attempt to put some directional equipment into working order without success. He could not proceed until the difficulty was solved. The Arma Corp. at Brooklyn was notified and informed the Bureau of Ordnance that the one man who could do the job was at New London, Conn. This man was in Washington the next day, out the same day, and out of the country the following day. It required less than a day to correct the trouble and the man was back in the country the next day.

F. R. Jeffreys of the Arma Corp., who has served seven months in the Pacific as a technician under the sponsorship of the Bureau of Ordnance, installed a submarine attack teacher, which simulates battle conditions. In

WHEN RUST-PROTECTING STORED WAR MACHINERY...

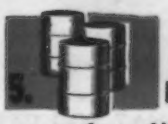
USE THESE 5 HOUGHTON AIDS

1. **"Preparation of War Production Equipment for Storage"**—New pocket-size digest of instructions issued to government inspectors . . . full data on rust preventive requirements included.

2. **"Digest of Corrosion Preventive Specifications"**—A handy guide to Army, Navy and AN "specs" now in force. Over 9,000 copies have already been distributed.

3. **"RUST—Causes and Prevention"**—80-page manual prepared by the Houghton Research Staff, covering all phases of cleaning and rust prevention.

4. **Technical Service**—Expert aid in setting up procedure for preparing war equipment for shipment or storage.



5. **Rust Preventive Compounds**—A complete line of tested preventives meeting and exceeding existing "specs"—grease, oil, solvent and plastic types.

* * *

For assistance in this important prelude to reconversion, call the Houghton Man or write E. F. HOUGHTON & CO., 303 W. Lehigh Avenue, Philadelphia 33, Penna.

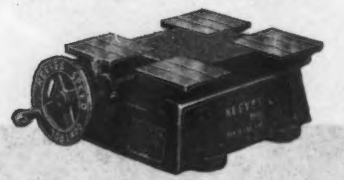
Houghton's

RUST PREVENTION SERVICE

How to convert any standard constant speed motor to a low-cost Stepless Variable Speed Drive...

1

Mount Your Motor on This REEVES Motor Base



Base is built in wide range of sizes to fit any standard constant speed motor up to 15 h.p. Includes sliding platform and handwheel for moving motor forward or back.

2

Apply This Disc Assembly to Motor Shaft

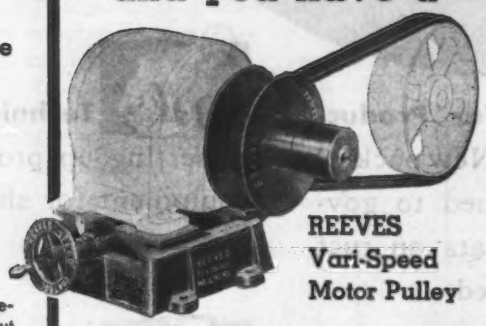
Assembly consists of two facing cone-shaped discs, one stationary, the other sliding laterally, and compression spring for mounting on extension shaft of motor.

3

Connect to Driven Machine With This Special V-Belt

Place specially designed REEVES V-belt between discs and over pulley on power input shaft of the driven machine. Adjust belt to minimum center. Anchor motor base.

and you have a



REEVES Vari-Speed Motor Pulley

available in sizes to 15 h.p. for stepless speed adjustability within 4:1 range.

HOW IT WORKS: The operation of a REEVES Motor Pulley is extremely simple—yet it follows the time-tested REEVES principle of a V-belt traveling between the adjustable driving diameters of cone-shaped discs. By turning handwheel, motor is moved forward or back on base, varying the driving diameters of the discs. As motor is moved toward driven machine, belt rides higher between discs, thus increasing the speed transmitted. Turning handwheel in opposite direction reverses the operation. Any speed within the range is accurately maintained.

WHAT YOU CAN DO WITH IT: The REEVES Motor Pulley is the simplest dependable method of providing infinitely variable speed adjustability to a driven machine. With this low-cost, easy-to-install equipment you can transform a machine with fixed speeds into a far more versatile production unit—one that is instantly responsive to every changing condition and work schedule. Install REEVES Motor Pulleys on your machines in service, and when you buy a new machine, look for the familiar REEVES handwheel that signifies REEVES-equipped.

For complete information on this and other REEVES units, send for Catalog 11-450

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Recognized Leader in the Specialized Field of Speed Control Engineering

Accurate Variable

REEVES Speed Control

Gives the Right Speed for Every Job!

this case, the contract with Arma called for installation and maintenance. This was the first of these devices to be installed outside the country.

Mr. Jeffreys set it up, put it in operating condition and instructed Naval personnel in its use. Arma, manufacturing precision devices, now has four men serving as technicians in the Pacific. These men handle any problem involving the company's equipment, making their task primarily one of maintenance.

The Bureau of Aeronautics maintains Area Coordinating Offices for its technicians at Pearl Harbor and Guam. A library and microfilm file is available to them. Men are generally assigned from these offices at the request of area commanders and rarely come direct from the States. They are now on a rotation policy. Average length of service is nine months.

There are about 125 technicians under the Bureau of Aeronautics. Their main objective is to make the availability of aircraft higher by improving the product and intensive maintenance instruction. The Bureau receives reports from its technicians as well as Navy personnel.

Technicians strive to keep the men in the field abreast of all modifications and in some cases follow new models right through from the plant to combat areas. The Navy says this method of operation pays off in quickly familiarizing the men with new planes and engines.

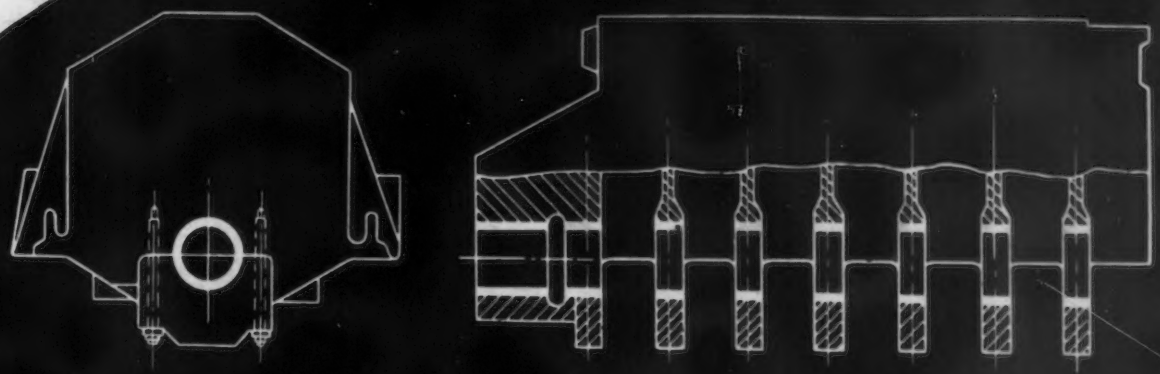
American Bosch, Bendix, Briggs, Consolidated, Curtiss Wright, Douglas, Fairchild Camera, Jack & Heintz, Pratt & Whitney, Sperry and many others have men in the Pacific area.

Whiting Corporation Back To Shorter Work Week

Chicago

• • • **The Whiting Corp.**, Harvey, Ill., has returned to a five day week with office employees working 40 hr a week instead of 48 and plant employees 50 hr instead of 55. Employees have been advised that the company will continue its wage adjustment plan under which each employee receives an 18 pct bonus every second week with the prospect that this rate will be made the minimum, enabling employees to receive additional bonuses when profits warrant. Employees were told that the company is in a position to maintain full production and employment.

PRECISION BOR



LINE BORING MAIN BEARINGS AND MAIN BEARING LINERS FOR CRANKSHAFT

20 PIECES PER HOUR AT 80% EFFICIENCY

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SPECIAL MACHINES

for automatically performing any one or a combination of metal cutting operations
TURNING · MILLING · DRILLING · BORING · REAMING · TAPPING · GRINDING

Government-owned equipment must be RUST-PROOFED before lay-up

Remember—you are required to rust-proof all Government-owned production equipment immediately upon termination of your war contract.

Only rust-proofing products accepted under Ordnance Specification PS 300-4 are approved for this purpose. TECTYL is so approved and there is a TECTYL product to meet every requirement.

TECTYL seals out moisture, protects against rust and corrosion for as long as two years—indoors and out. A little TECTYL covers a lot of metal.

Don't overlook the value of TECTYL as a rust and corrosion preventive on your peace-time products. Used on materials-in-process and on completed units, TECTYL can prevent serious losses from spoilage.

Write today—tell us your corrosion problem and we'll send you a Tectyl bulletin with complete application data.

TECTYL STOPS RUST

VALVOLINE OIL COMPANY

431 Main Street, Dept. 25 I, Cincinnati 2, Ohio

Refinery at Butler, Pennsylvania General Offices, Cincinnati, Ohio

New York-Atlanta-Pittsburgh-Chicago-Detroit-Los Angeles-Vancouver, B. C.-Washington, D. C.

The Stuff of Heroes

We are indebted to the *Los Angeles Daily News* for the following:

An anonymous newsman, revolted at the phony glamor that goes into interviews with returning servicemen, dreamed up the following.

It purports to be a chat between Lt. Roger Rudder, just returned from knocking off dozens of Jap planes, the press and Col. Eager Beaver of Army public relations.

PRESS: Welcome home, Lieutenant Rudder, how does it feel to be back in the good old U.S.A.?

RUDDER: How the hell do I know?

COLONEL BEAVER (to press): Lieutenant Rudder's eyes were misty when the outline of the Golden Gate bridge, symbol of American faith and liberty, loomed into sight.

PRESS: What is the first thing you're going to do?

RUDDER: I got a telephone number here, if she's as good . . .

COLONEL BEAVER: He intends to fly back to his old home town and see his Mom and all the folks.

PRESS: Are they going to give you the Congressional Medal?

RUDDER: They damn well should.

COLONEL BEAVER: Lieutenant Rudder's modesty disclaims any high award. "Every man in the battle line deserves it as much as I," he told me.

PRESS: What about the case of whisky General Geevil was going to give you?

RUDDER: Aw, he loused out on me.

COLONEL BEAVER: Lieutenant Rudder is a teetotaler. At his suggestion, the price of a case was generously donated to Russian relief.

PRESS: What about the Japanese?

RUDDER: Those jokers! They don't know which side is up.

COLONEL BEAVER: The lieutenant means the quality of the Japanese airman is declining.

PRESS: We understand you are going to visit the factory that made your plane.

RUDDER: Yeah, I want to get my hands on the moron that welded his lunchbox to my tail section.

COLONEL BEAVER: He is proud of our American workers and the magnificent job they've done to back the attack.

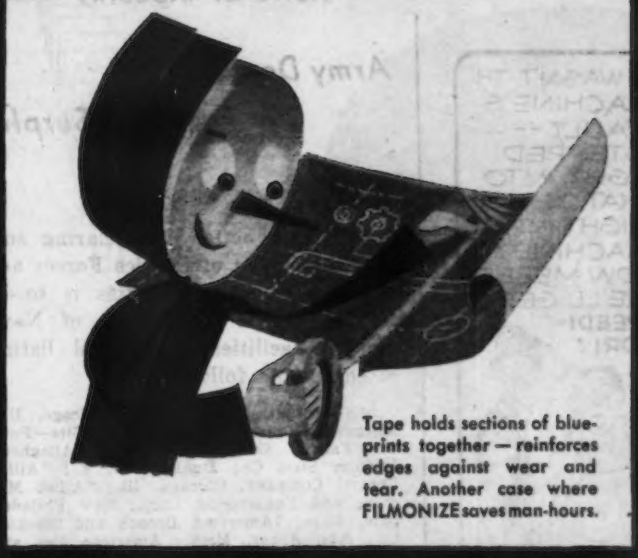
RUDDER: Sorry, boys, I've got to get going before the bars close and line up . . .

COLONEL BEAVER: Lieutenant Rudder can't wait to get back to his Mom's apple pies, the girl he left behind him and the street he played Indian on as a small boy. If there are any more questions, gentlemen, I believe I can answer them.

Cancellations Being Felt

Cincinnati

• • • **Cancellation** of war contracts was noted during the past week in this area. At the same time, however, manufacturers began to arrange schedules to accommodate unrated orders heretofore held in abeyance. In recent months most plants have been cutting into backlogs so that cancellations in many cases did not hurt too greatly.



Tape holds sections of blueprints together — reinforces edges against wear and tear. Another case where FILMONIZE saves man-hours.

Tape keeps safety goggles from becoming scarred and pitted. Use transparent FILMONIZE—it's easy to put on—easy to remove.

Tape covers the shop foreman's blueprint completely —protects it against grease and grime. Do it with transparent FILMONIZE.

Tape reseals opened cans—prevents evaporation—deterioration. FILMONIZE — in colors — also helps identify the contents of the cans.

Tape protects

SAVES MATERIALS, EQUIPMENT

• Are you using tape imaginatively? Have you thought of the hundreds of ways FILMONIZE can save time, materials, money in your plant? One of our Tape Engineers will be glad to counsel with you on this vital subject—and we'll send him any time you say.

• Meantime, remember FILMONIZE is the tape that *stands up*—that doesn't "curl back"—doesn't tangle. Production men say it handles faster—is more economical.

• A phone call to your distributor will bring the whole FILMONIZE line—of Transparent Tapes, Colored and Multi-Colored Tapes, Printed Tapes, Riveting Tapes, Identifying Tapes, Splicing Tapes, Acetate Fibre Tapes, Metal Tapes, Specialty Tapes, Packaging Tapes. In all widths from ½" to 18".

Filmonize

TRADE MARK REG.

SELF-SEALING TAPES

INTERNATIONAL PLASTIC CORPORATION

Morristown New Jersey

OUT OUR WAY

YOU AIN'T HURT, PHIL? STAY RIGHT THERE A MINUTE--WE WANT TO INVESTIGATE THE CAUSE OF THIS!
HOW COULD HE GET PULLED OVER THAT WAY WHEN TH' MACHINE RUNS THE OTHER WAY?
IT USED TO BE A DISGRACE TO GET CAUGHT IN A MACHINE WHEN THEY WAS EASY TO GET CAUGHT IN--NOW WITH THEM MADE SAFE, YOU'RE A KIND OF HERO!
IT WASN'T TH' MACHINE'S FAULT--STEPPED RIGHT INTO THAT OIL--SLID RIGHT INTO TH' MACHINE! NOW MEBBE WE'LL GET SPEEDI-DRI!
J.R.WILLIAMS
FOOLING THE INVENTOR
T. M. REG. U. S. PAT. OFF.
COPR. 1945 BY NEA SERVICE, INC.

"Have been constantly using it, since receiving initial shipment."

"Have just ordered the third lot of 2500 lbs."

"Have been able to eliminate constant scrubbing."

"After trying out various methods, SPEEDI-DRI is the one certain solution."

"Conservatively estimate an annual saving of $1000."

WE HAVE HUNDREDS of letters like the above in our files. Many plants, where oil and grease used to make floors slippery and dangerous, are now ordering SPEEDI-DRI by the carload.

SPEEDI-DRI is successful because it does the job and it's easy to use. It's safety's magic carpet. It's an oil-thirsty, granular material that soaks up oil or grease from any kind of floor. SPEEDI-DRI is non-inflammable and fire-retardant. It will help prevent dermatitis caused by oil-soaked shoes. It eliminates complicated cleaning-machines, or trained workmen. You just spread SPEEDI-DRI wherever oil or grease accumulates. It soaks-up the oil and grease. Then you sweep it up with a broom.

One plant took fourteen men off floor-maintenance when they found SPEEDI-DRI. Pin your business-card to this advertisement and mail it to us, for a big FREE sample.

SUPPLIERS: East—Refiners Lubricating Co., New York 1, New York.
Midwest & South—Waverly Petroleum Products Co., Philadelphia 6, Pa.
West Coast—Waverly Petroleum Products Co., Russ Bldg., San Francisco 4, Calif.

SPEEDI-DRI
OIL AND GREASE ABSORBENT

Army Declares 252 Facilities Surplus

Washington

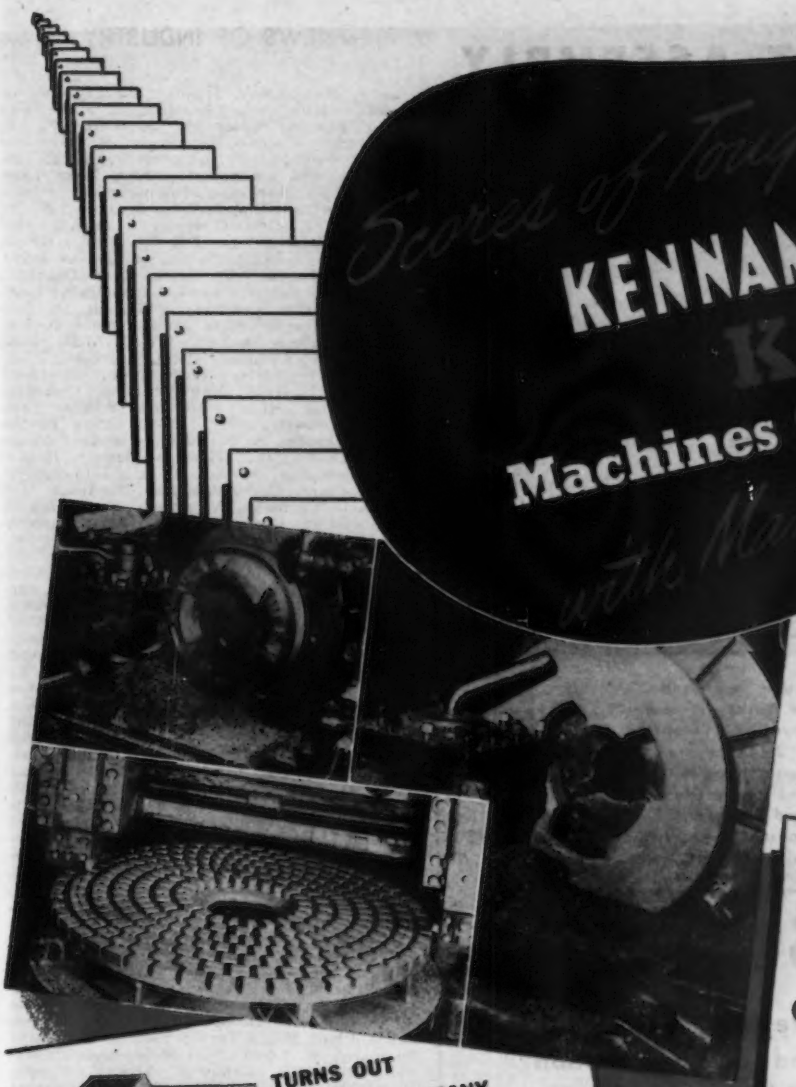
• • • **Army action** in declaring surplus a long list of Service Forces and Air Forces plant facilities is to be followed by a similar list of Navy surplus facilities. A partial listing of the plants follows:

*Ahlberg Bearing Company, Chicago, Ill.; Allegany Ordnance Plant (Pinto Site—Powder Farm), Cumberland, Md.; *Allegheny Ludlum Steel Co., Dunkirk, N. Y.; *Allied Control Company, Chicago, Ill.; *Allied Machine and Engineering Corp., New Philadelphia, Ohio; *American Broach and Machine Co., Ann Arbor, Mich.; American Car and Foundry Co. (Tank Plant), Berwick, Pa.; American Locomotive Company (next to company's privately-owned plant), Schenectady, N. Y.; *American Rolling Mill Co. (Sheffield Steel of Texas Div.), Channel, Houston, Tex.; American Type Foundries, Inc. (Cowdrey Machine Div.), Fitchburg, Mass.; American Type Foundries, Inc. (Artillery Plant), Elizabeth, N. J.; *American Welding and Manufacturing Co. (Tank Plant), Warren, Ohio; Arkansas Ordnance Plant, Jacksonville, Ark.; *Auto Specialties Manufacturing Co., St. Joseph (Benton Harbor), Mich.; Baytown Ordnance Works, Baytown, Tex.; *J. B. Beaird Company, Plant No. 2), Shreveport, La.; *Bell and Howell Company, Lincolnwood, Ill.; *Bell Machine Company, Oshkosh, Wis.; *Bendix Aviation Corp. (Bendix Division), Towson, Md.; *Blaw Knox Company (Union Castings Division), Pittsburgh, Pa.; *Bliley Manufacturing Company, Erie, Pa.; Bluebonnet Ordnance Plant, McGregor, Tex.; Borg Warner Corporation (Warner Gear Division), Muncie, Ind.; *Broden Construction Co., Cleveland (Euclid), Ohio; Brown and Bigelow, St. Paul, Minn.; Buckeye Ordnance Works, Ironton, Ohio; Burgess Norton Manufacturing Co., Geneva, Ill.; Cactus Ordnance Works, Dumas, Tex.; *Cardox Corporation (next to company's privately-owned plant), Claremore, Okla.; *Chambersburg Engineering Co. (next to company's privately-owned plant), Chambersburg, Pa.; *Chicago Vitreous Enamel Products Co., Chicago; *John J. Chaloux & Co., Colonie, N. Y.; *Cincinnati Shaper Company, Cincinnati; *Cities Service Refining Corp., Lake Charles, La.; *Clearing Machine Co., Chicago; *Cleveland Automatic Machine Co., Cleveland; *Colt Patent Fire Arms Co., Hartford, Conn.; *Commercial Shearing and Stamping Co., Youngstown, Ohio;** *Continental Foundry and Machine Co., East Chicago, Ind.;** Wheeling, W. Va.;** *Continental Foundry and Machine Co., Coraopolis, Pa.;** *Continental Foundry and Machine Co., East Chicago, Ill.;** *Continental Motors Corporation (Texas Division—Automotive Engines), Garland, Tex.; *Continental Oil Company (next to company's privately-owned plant), Ponca City, Okla.; Converted Rice, Houston, Tex.; *Cooper Bessemer Corp., Mt. Vernon, Ohio;** Cornhusker Ordnance Plant, Grand Island, Neb.; *Couse Laboratories, Newark; *Cross Gear and Machine Co., Detroit; *H. L. Crowley & Company, Inc. (next to company's privately-owned plant), West Orange, N. J.; Crucible Steel Company, Harrison, N. J.; *Daybrook Hydraulic Corp. (next to company's privately-owned plant), Bowling Green, Ohio; Des Moines Ordnance Plant, Des Moines, Iowa; Dixie Ordnance Works, Monroe, La.; *Doehler Jarvis Corp., Grand Rapids, Mich.; *Dolomite Products Co., Inc. (next to company's privately-owned plant), Gates, N. Y.; *Eicor, Inc., North Chicago, Ill.; *Eitel-McCullough, Inc., Salt Lake City; *Erie Resistor Corporation, Erie, Pa.; Evansville Ordnance Plant, Evansville, Ind.; *Ex-Cell-O Corporation, Detroit; *Ferro Enamel Corporation, Bedford, Ohio; *Firestone Tire and Rubber Co. (formerly Fairchild Engine & Aircraft Corp.), Burlington, N. C.; *Fitchburg Engineering Company, Fitchburg, Mass.; Ford Motor Company (Lincoln Plant), Detroit; Ford Motor Company (River Rouge Plant), Dearborn, Mich.; Ford Test Track, Chicago; Ford Test Track, Revere, Mass.; Fostoria CWS Plant No. 1, Fostoria, Ohio; Fostoria CWS Plant No. 2, Fostoria, Ohio; Gary Armor Plate Plant, Gary, Ind.; *Gatti, Aurele M., Inc., Trenton, N. J.; Gear Grinding Machine Com-

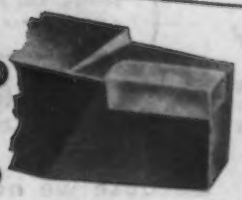
Scores of Tough Jobs Prove

KENNAMETAL K6 Machines CAST IRON

With Maximum Economy

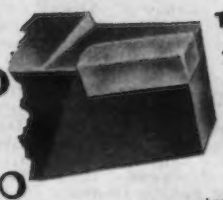


Kennametal Grade K6 is one of the most useful and needed recent developments in tool materials for machining cast iron and non-ferrous metals. It is an improved tungsten carbide having unusual strength in combination with exceptional abrasion-resistance and high hardness. The four performance studies outlined below are typical of scores of comparative service results that clearly show the superior properties of K6 for interrupted and continuous cutting on cast iron.



REMOVES TONS OF METAL FROM CHILLED CAST IRON PARTS, AT TOOL COST OF 74¢ PER TON

Style 12 Tool with K6 tip turns 1½ lineal miles between grinds! Other makes of carbide failed at all speeds and feeds. After 10 regrinds K6 tip is used on lighter jobs. Operation—turning cast iron piston trunks, 21½" diameter, having six 3" or 4" ports (interrupted cut). Chilled around port holes. Very sandy surface. Feed—.09375". Depth of cut —½". SFM-120.



TURNS OUT 10 TIMES AS MANY PIECES, ON ROUGH CASTING, BETWEEN REGRINDS

One to four pieces between grinds was the best performance recorded by other carbides on machining a webbed flange of inferior grade cast iron, having hard spots, and sand pockets. K6 turns out more than 40! Operation—turning outside diameter and facing both sides of hub and rim. Feed —.032" Depth of cut 1/16" to 3/8". SFM-280.

MULTIPLIES OUTPUT, ON FACING OPERATION, ON SANDY IRON CASTING

Replacing another make of carbide with a Style 11HD Tool having a clamped-on, advanceable K6 tip, made possible tripling the feed, doubling the cutting speed, and facing 8 times as many pieces per regrind. Operation—facing sandy iron castings. Feed—.036". Depth of cut—⅛" to 3/16" SFM-150 at start, 320 after tool entered cut.

CUTS 35 PIECES (on Abrasive Electric Iron) AS AGAINST 3 FOR CARBIDE PREVIOUSLY USED

This unique tool, tipped with Kennametal K6, turns out 11½ times as much work between grinds as the carbide tool previously used. Operation—finish trepanning cut on electric iron part. Feed—.003". SFM-210. Accurate tolerances and good finish required, and produced.

The best way to prove that K6 makes possible better, faster machining on cast iron, at lower tool costs, is to try it in your own shop—then compare tool performance and overall costs. Order a few Kennametal blanks, or complete tools, now—and ask our district field engineer, who is fully acquainted with the properties of K6, to help you get maximum results from this *new* and *improved* tungsten carbide—Kennametal Grade K6.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL *Inc.*, LATROBE, PA.

This LENS MOUNT ASSEMBLY

This assembled unit—produced COMPLETE at Federal Screw Works—measures 1 5/8" dia. x 15/16" over all. Except for brass split ring (part 2), parts are aluminum. Part 1 is multiple-threaded (6 threads) and fits similar internal threads in part 5. Part 3 has three tapped holes for the .080"-dia. screws. Rim of part 4 is knurled on half circumference only

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NEWS OF INDUSTRY

pany, Hamtramck, Mich.; *General Ceramics and Steatite Corp., Keasbey, N. J.;** *General Electric Company, Syracuse, N. Y.; *General Electric Company, E. Syracuse, N. Y. (buildings); Schenectady, N. Y. (machinery and equipment only); West Lynn, Mass. (machinery and equipment only); *General Electric Company, E. Syracuse, N. Y.; *General Electric Company (Ken-Rad Tube and Lamp Division), Tell City, Ind.; Owensboro, Ky. (machinery and equipment only); General Motors Corporation (New Departure Division), Bristol, Conn.; *Giddings Lewis Machine Tool Company (adjacent to company's privately-owned plant), Fond du Lac, Wis.; Gopher Ordnance Works, St. Paul, Minn.; Gulf Ordnance Plant, Aberdeen, Miss.; *Gunite Foundries Corporation, Rockford, Ill.;** *Hanchett Manufacturing Company, Big Rapids, Mich.; *Hercules Powder Company (formerly part of New Jersey Powder Plant), Parlin, N. J.; *High Standard Manufacturing Co., Inc., Hamden, Conn.; *Hughes Tool Company, Houston, Tex.; Illinois Ordnance Plant, Carbondale, Ill.; *Indiana Steel Products Company, Valparaiso, Ind.; Ingalls Shipbuilding Corp., Decatur, Ala.; International Harvester Company (Ostrander-Seymour Plant), Cicero, Ill.; *International Industries, Inc. (adjacent to company's privately-owned plant), Ann Arbor, Mich.; *International Resistance Company, Philadelphia, Pa.; *Isolantite, Inc., Belleville, N. J.; Jayhawk Ordnance Works, Pittsburgh, Kan.; *Kearney & Trecker Corporation, Milwaukee; *Kelsey-Hayes Wheel Company, Detroit; *Kenosha Brass Company (adjacent to 18th Ave. Plant of operator—American Brass Co.), Kenosha, Wis.; Kentucky Ordnance Plant, Paducah, Ky.; Keystone Ordnance Works, Geneva, Pa.; Kobe, Inc., Huntington Park, Calif.; Koppers Company (Bartlett Hayward Division), Baltimore; *Lampco Products Company, Byesville, Ohio;** *Liberty Planers, Inc., Hamilton, Ohio; Lima Tank Arsenal, Lima, Ohio; Lipe-Rollway Corporation, Syracuse, N. Y.; *Lithaloys Corporation, New York; *Magnolia Petroleum Company, Beaumont, Tex.; *Marathon Battery Co., Wausau, Wis.; Maury CWS Plant, Columbia, Tenn.; *McConway & Torley Corporation, Pittsburgh, Pa.;** Midland CWS Plant (adjacent to Dow Chemical Co.'s Plant), Midland, Mich.; *Michigan Steel Castings Company, Detroit; *Micromatic Hone Corporation, Detroit; Milan Ordnance Center (incorporates Milan Ordnance Depot and Wolf Creek Ordnance Plant, Milan, Tenn.; *Mines Equipment Company, St. Louis, Mo.; Minneapolis-Honeywell Regulator Company (Buzza Plant), Minn.; Minneapolis Moline Power Implement Co. (Como Forge Plant), St. Paul; Mississippi Ordnance Plant, Flora, Miss.; Missouri Ordnance Works, Louisiana, Mo.; *Morton Manufacturing Company, Muskegon Heights, Mich.; *Motor Castings Company, West Allis, Wis.; Mound Road Boxing Plant, Detroit; *Murchey Machine and Tool Company, Detroit, *National Acme Company, Cleveland; *National Carbon Company, Inc., Charlotte, N. C.; National Supply Company, Torrance Calif.; *National Union Radio Corporation, Lansdale, Pa.; Newark, N. J. (machinery and equipment only); Maplewood, N. J. (machinery and equipment only); Robesonia, Pa. (machinery and equipment only); *New Britain Machine Company, New Britain, Conn.; New River Ordnance Plant, Pulaski, Va.; New York Air Brake Co. (presently known as Warehouse No. 7500), Watertown, N. Y.; New York Ordnance Works, Baldwinsville, N. Y.; Niagara Falls CWS Plant, Niagara Falls, N. Y.; *Odenbach Shipbuilding Corporation, Greece, N. Y.; Ohio River Ordnance Works, Henderson, Ky.; Ohio Steel Foundry Company, Lima, Ohio; Oklahoma Ordnance Works, Pryor, Okla.; *Onsrud Machine Works, Inc., Chicago; Ordnance Steel Foundry Company, Bettendorf, Iowa; Otis Elevator Company, Buffalo; *Ozark Chemical Defense Corporation, Tulsa, Okla.; Ozark Ordnance Works, El Dorado, Ark.; *Pacific Car & Foundry Company, Renton, Wash.; *Pacific Car & Foundry Company, Renton, Wash.;** Pantex Ordnance Plant, Amarillo, Tex.; Perfex Corporation, Milwaukee; *Perkins-Elmer Corporation, Glenbrook, Conn.; Phelps Dodge Copper Products Corporation, Yonkers, N. Y.; Philadelphia Armor Plate Plant No. 1, Philadelphia; *Phillips Petroleum Company (adjacent to company's privately-owned plant), Borger, Tex.; *Pipe Machinery Company, Cleveland; *Pittsburg Steel Foundry Corporation, Glassport, Pa.;** Plum Brook Ordnance Works, Sandusky, Ohio; Pressed Steel Car Company (Armored Tank Division), Chicago; *Putnam Tool Company, Detroit; Quad Cities Tank Arsenal, Bettendorf, Iowa; *Radio Condenser Company, Camden, N. J.; *Radio Specialties Mfg. Co., Portland, Ore.; *Raytheon

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The following production services of the Barium Steel Shops are now available for contract work in melting and refining, forging, heat-treating and machining. We welcome particularly work of a difficult nature on which our modern facilities, skilled personnel and *Unified Control* can produce unusually satisfactory results.

Forging Hammers . . . We now have available 1500-ton and 1000-ton forging presses for heavier requirements, and steam forging hammers of up to 12,000 pound capacities for flat die work.

Melting Facilities consist of several open hearth furnaces up to 35 tons in size — now melting and meeting all analyses of carbon and a range of alloy steels to the critical specifications of both the United States Government and the aircraft industry. We can cast ingot sizes up to 42" diameter and 40,000 lbs. in weight.

Heat-Treating and Annealing furnaces of the most modern type are included in our plant, as well as

Machining Facilities and a well equipped

Chemical and Metallurgical Laboratory

This *Unified Control* is available to you in whole or in part. We welcome your inquiries.

BARIUM STEEL CORPORATION

Producers of Carbon, Alloy and Stainless Steels

CANTON · OHIO

COIL HANDLING TO PICKLERS THE *Logan* WAY

Close-up of a Logan Coil Turnover in action. The motor driven screw operating mechanism is centrally located in pit directly below the tilting carriage. Note adjustable bumper at end of trough roll line on Side-Tilter.

THE LOGAN conveyor system in this well organized steel mill can be visualized from the accompanying picture which shows at a glance the important part it plays in handling coils to picklers. The gravity storage, or loading lines in foreground receive coils on end from crane. Coils are released one at a time to Turnovers which down-tilt the coil onto the trough roll line for delivery to Side-Tilter in front of pickling unit.

Heavy duty handling has long been a Logan specialty and our policy will be, as it has been in the past, to produce conveying equipment that is soundly engineered and ruggedly built by men who know steel mill requirements. Catalog and engineering data will be sent on request.

Logan Co., Inc., 545 Cabel St., Louisville 6, Kentucky

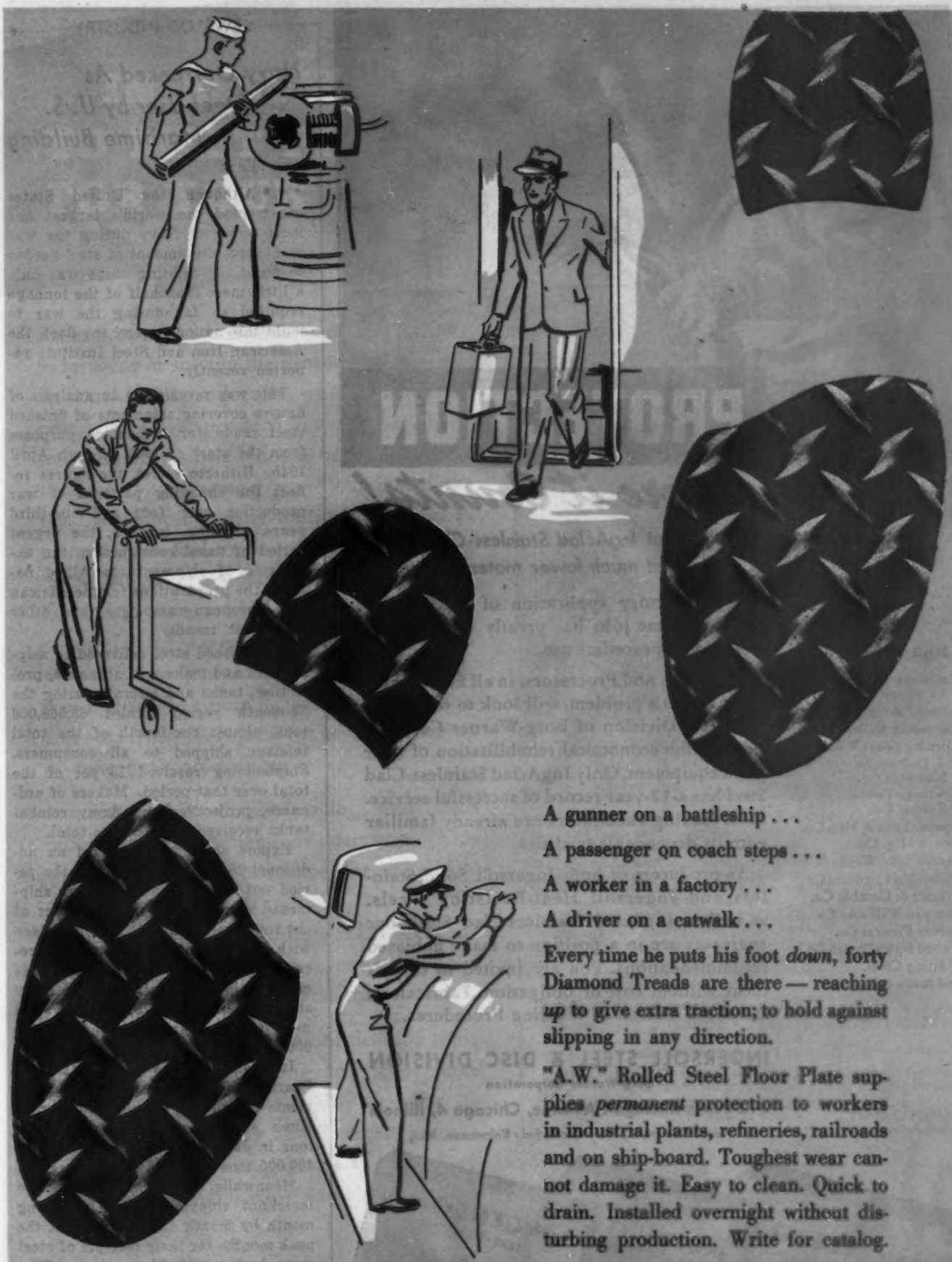
Logan Conveyors

PUT *FLOW* INTO PRODUCTION

Mfg. Co., Newton, Mass.; *Reed Prentice Co. No. 2, Worcester, Mass.;** *Reed Roller Bit Company, Houston, Tex.; *Gus Reinke Machinery & Tool Co., Hillside, N. J.; Reynolds Metals Corp., Louisville, Ky.; *Rheem Mfg. Co., Houston, Tex.; *Sal-Way Steel Treating Co., Detroit; San Bernardino CWS Plant, San Bernardino, Calif.; Sangamon Ordnance Plant, Illiopolis, Ill.; Scioto Ordnance Plant, Marion, Ohio; *Scullin Steel Company, St. Louis; Searchlight Mirror Plant No. 2, Mariemont, Ohio; *Simpson Electric Company, Chicago; Somerville Test Track, Somerville, Mass.; Southwestern Proving Ground, Hope, Ark.; *Standard Oil Company of Louisiana (adjacent to property of Standard Oil), Baton Rouge, La.; *Strom Steel Ball Co., Cicero, Ill.; Struthers Wells Corp., Titusville, Pa.; Studebaker Test Track, South Bend, Ind.; *Stupakoff Ceramic Mfg. Co., Latrobe, Pa.;** *Sundstrand Machine Tool Co. (directly opposite company's privately-owned plant), Rockford, Ill.; *Super Tool Company, Warren, Mich.; *Sylvania Electric Products, Inc., Montoursville, Pa.; Towanda, Pa. (machinery & equipment only); Brookville, Pa. (buildings); Wakefield, Mass. (buildings); Emporium, Pa. (machinery and equipment only); Salem, Mass. (machinery and equipment only; Symington Gould Corp., Depew, N. Y.; *Symington Gould Corp. (adjacent to company's privately-owned plant), Rochester, N. Y.; *Tantalum Defense Corp., North Chicago, Ill.; Tennessee Coal, Iron and Railroad Co. (Ensley Works—Shell Division), Ensley, Ala.; Texas Electric Steel Castings Co., Houston, Tex.; Timken Detroit Axle Company (Forge Plant), Detroit; Timken Detroit Axle Company (Studebaker Plant), Detroit; Timken Ordnance Plant, Canton, Ohio; *Timken Roller Bearing Co., Columbus, Ohio; Toledo Core Plant, Toledo; *Towmotor Corporation, Cleveland; Trojan Powder Company, Allentown, Pa.; *Tung-Sol Lamp Works, Inc. (1st St. Plant), Newark; *Tung-Sol Lamp Works, Inc., Weatherly, Pa.; Turlock CWS Plant (Day & Nite Flare Corp.—Ammunition Plant), Turlock, Calif.; *United Electronics Company, Newark; *Utica Drop Forge and Tool Corp., Yorkville, N. Y.; Utica Proving Ground, Utica, Mich.; Victory Ordnance Plant (Caterpillar Military Engine Co.'s Tractor Plant), Decatur, Ill.; Vilter Manufacturing Company, Milwaukee; *Vinco Corporation, Detroit; *Vulcanite Portland Cement Co. (formerly Nice Ball Bearing Co.), Willow Grove, Pa.; Warehouse No. 4001, Detroit; *Warner & Swasey Company, Cleveland; Wehr Steel Company (Tank Armor Castings Plant), Milwaukee; *Western Electric Co., Inc., Scranton, Pa.; *Westinghouse Electric & Manufacturing Co., Fairmont, West Va.; Lansdowne, Md.; *Wickes Brothers, Saginaw, Mich.;** *Willamette Iron and Steel Company, Portland, Ore.; *Worthington Pump and Machinery Corp., Buffalo; *Wrentham Products Company, Wretham, Mass.; Yuba Manufacturing Company, Benicia, Calif.

*Aeronca Aircraft Corp. (adjacent to company's privately-owned plant) Middletown, Ohio; *Bellanca Aircraft Corp. (plant located in middle of company's privately-owned plant), New Castle, Del.; *Briggs Manufacturing Company (Outer Drive Plant), Detroit; *China Aircraft Corp., San Francisco; Consolidated Vultee Aircraft Corp., Downey, Calif.; *Fairchild Engine & Airplane Corp. (Ranger Aircraft Division), Jamaica, N. Y.; *Ford Motor Company (River Rouge Aircraft Engine Plant), Dearborn, Mich.;** *General Alloys Company, Boston;** *General Railways Signal Company, Rochester, N. Y.; *Haskelite Manufacturing Company, Grand Rapids, Mich.;** *Howard Foundry Company, Inc., Chicago; *Huck Manufacturing Company, Detroit;** *Industrial Fabricators Company, Burbank, Calif.; Kinner Motors, Inc., Glendale, Calif.; *Maryland Sanitary Manufacturing Company, Baltimore, Md.; McDonnell Aircraft Corporation (including Modification Center No. 15), Memphis, Tenn.; *McDonnell Aircraft Corporation (Airport Plant), Memphis, Tenn.; *Models, Inc. (adjacent to company's privately-owned plant), North Bergen, N. J.; Modification Center No. 6, Evansville, Ind.; Modification Center No. 7, Niagara Falls, N. Y.; Modification Center No. 19, Kansas City; *Moser-Jewel Company, Perth Amboy, N. J.; *Murray Corporation of America, Scranton, Pa.; *Northwestern Aeronautical Corp., St. Paul; *Pesco Products Company, Cleveland; *Republic Aviation Corporation, Evansville, Ind.; *Reynolds Metals Company (Fabricating Plant), Louisville;** *Reynolds Metals Company (formerly Mengel, Inc.), Louisville; *Schweizer Aircraft Corporation, Big Flats, N. Y.; *Servel, Inc. (adjacent to company's privately-owned plant), Evansville, Ind.; *Union Ford and Hoe Company, Rome, N. Y.; *Waco Aircraft Company, Troy, Ohio.

* DPC Plants.
** Alongside company's privately-owned plant.



A gunner on a battleship . . .

A passenger on coach steps . . .

A worker in a factory . . .

A driver on a catwalk . . .

Every time he puts his foot *down*, forty Diamond Treads are there — reaching *up* to give extra traction; to hold against slipping in any direction.

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The satisfactory application of IngAclad to many wartime jobs has greatly increased interest in its peacetime use.

Producers and Processors, in all fields where corrosion is a problem, will look to the Ingersoll Steel Division of Borg-Warner Corporation for the economical rehabilitation of their plant equipment. Only IngAclad Stainless-Clad Steel has a 12-year record of successful service. Most leading Fabricators are already familiar with its dependable qualities.

As producers of both Ingersoll Solid Stainless and Ingersoll Heat-Resisting Steels, as well as IngAclad Stainless-Clad Steel, our engineers are in a position to make unbiased recommendations. You are invited to consult them without cost or obligation. Fabricators: Write for Manual of Welding Procedures.

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NEWS OF INDUSTRY

Navy Outranked As Steel User by U. S. Maritime Building

New York

• • • **Although the United States constructed the world's largest and most powerful Navy during the war in Europe, the amount of steel needed to build the fighting ships was only a little more than half of the tonnage required so far during the war to build this nation's merchant fleet, the American Iron and Steel Institute reported recently.**

This was revealed in an analysis of figures covering shipments of finished steel made for armament purposes from the start of 1941 through April 1945. Hitherto secret, the figures reflect the changing patterns of war production over four and one-third years, showing, in turn, the urgent period of naval construction, the expediting of shipments to Allied nations, the preparations for the African and European campaigns, and other significant trends.

The finished steel delivered to shipbuilders and makers of ordnance, projectiles, tanks and aircraft during the 52-month period totaled 63,568,000 tons, almost one-fourth of the total tonnage shipped to all consumers. Shipbuilding received 13 pct of the total over that period. Makers of ordnance, projectiles and Army combat tanks received 9 pct of the total.

Export shipments required an additional 25,372,000 tons during the period out of the grand total of shipments, equivalent to about 10 pct of the total steel shipped. In comparison with that tonnage, shipbuilders received 35,519,000 tons, of which yards engaged in the construction of Navy ships received 13,370,000 tons and merchant shipyards received 22,150,000 tons.

Immediately after the attack upon Pearl Harbor in December, 1941, shipments for naval construction began to climb sharply, rising from 157,000 tons in January 1942, to a record of 490,000 tons in July 1942.

Meanwhile, shipments of steel to merchant shipyards were increasing month by month during 1942, but the peak months for their receipts of steel came during 1943. The peak was 775,000 tons in August, 1943.

On an annual basis, shipments to naval and merchant yards combined were highest in 1943 at 11,508,809 tons.

Three months in 1942, July, August and September, were the heaviest

...IN ASSEMBLIES...A SMART WAY TO MEET PRODUCTION SCHEDULES FOR YOUR POST-WAR PRODUCTS

An improvement *in methods* is the first answer to look for in solving the problem of stepped-up demands of production, whether in war or peace times. War production would have been immeasurably slowed down had it not been that the *thread-forming screw* eliminated the need for tapping many millions of holes in material that had to be joined together in a hurry. Wherever a thread-forming screw could be used in the assembly or fabrication of war materiel, time was saved when time was most precious. Saving of time by American methods was one of the prime factors in winning this war—an essential ingredient of quick pick-up of peacetime production.

Lamson makes thread-forming and sheet metal screws in tremendous quantities. Three standard types are produced for metal and plastic applications. Types "a", "c" and "b" are made with slotted, Phillips or Clutch heads. Type "c" (thread-forming) screws have American National Standard coarse thread.

Because of the need for more detailed information on thread-forming and sheet metal screws, a new Lamson folder showing detailed lists, stock sizes and essential information is ready for you. Just use the coupon at the right to get your copy. Samples of Lamson thread-forming and sheet metal screws will be sent you on request.

THE LAMSON & SESSIONS COMPANY, General Offices: Cleveland 2, O.

Plants at Cleveland and Kent, Ohio; Chicago and Birmingham

"BOLTS, NUTS & SCREWS"—1944 REVISION. Cloth bound. Limited edition, 180 pages of technical, practical information. Sent prepaid for *$1.00—cash or check must accompany your order.*

"BOLTS ARE IMPORTANT!"—24-page booklet of currently useful information for buyers of headed and threaded products, and describing Lamson & Sessions' specialty fastenings which have wide industrial applications *—now, and in the post-war period. Sent gratis.*

"THE LAMSON BLUE BOOK"—is our standard Catalog of standard products excepting our Aircraft products. *Sent gratis.*

"SIMPLIFIED STOCK LIST"—Of bolts, nuts and screws, conforming to latest revisions of the Office of Price Administration, and of great value in showing you in what ratio quantities of various standard products are kept in stock for deliveries, by your jobbers and in our own (and other bolt manufacturers') warehouse stocks. *Sent gratis.*

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Name of Individual _____ Title or Kind of Work

Employed by (Name of Company) _____

Street Address _____

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ARMSTRONG
The "Armstrong System" permits the new higher cutting speeds
The urgencies of war have led to the universal use of greatly increased cutting speeds. Today it is not uncommon to find production machine tools actually operating *many times faster* and with greater efficiency than the "standard" cutting speeds of past generations permitted. What is not generally understood is that a similar step-up is equally practical for ordinary operations on standard tool room lathes, planers and shapers.
With the correct ARMSTRONG TOOL HOLDERS for each operation and modern ARMSTRONG HIGH SPEED, ARMIDE (Carbide-Tipped) and ARMALLOY (Cast-Alloy) Cutters, Bits and Blades you can safely increase both speeds and feeds materially, reducing machining time per operation or piece and substantially raise your output per machine-hour.
With the Armstrong System you can make this change-over to high speed operation at will, for ARMSTRONG TOOL HOLDERS and ARMSTRONG CUTTERS are stocked by the leading industrial tool departments in your locality and can be purchased as needed. Start the "modernizing" program now, write for catalog.
ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
309 N. Francisco Ave., Chicago 12, U.S.A.
Eastern Whse. & Sales:
199 Lafayette St., New York 12, N. Y.
Pacific Coast Whse. & Sales Office:
1275 Mission St., San Francisco 3, Calif.

months for exports of steel during the European war. In July of that year, a peak amount totaling 829,000 tons started abroad, with virtually seven-eighths of this tonnage destined for Great Britain and the British Empire. The year 1942 was the largest export year of the period with 7,660,000 tons, 12 pct of the total finished steel that year, leaving the mills for overseas.

The record month in shipments of steel to makers of Army tanks came early in 1943 when the Allies were striving to clear the Nazis from Africa in mobile warfare. Makers of ordnance, projectiles and Army combat tanks received 24,728,000 tons of steel over the period of four years and four months.

May 1943 and March 1945 were the crests in shipments of steel for ordnance and small arms. In each of those months, tonnages totaled around 143,000 tons.

Only a few months ago came a peak in shipments of steel to makers of shells, bombs, projectiles and ammunition for small arms. Shipments of steel to producers of those items totaled 606,000 tons in March of this year.

Alleges Illegal Price On Washing Machines

Chicago

• • • Electric Household Utilities Corp. has been charged with delivery of 5000 washing machines at prices approximately 25 pct above the ceiling level in what the Office of Price Administration terms the first reconversion price suit in the country. The OPA asks $150,000 treble damages.

The company, without filing for an individual reconversion price ceiling, sent the machines to its distributors with above-ceiling price tags, the OPA charges. The distributors received the machines with the stipulation that the prices charged were subject to OPA approval and that credit would be given if lower prices should be approved. The company declares that it expected that the higher prices would be approved, according to OPA. Other manufacturers, many of them unable to get into production as quickly as Electric Household Utilities have withheld shipment of merchandise pending possible adjustment of what is claimed to be an inequitable ceiling.

THE HIGH QUALITY OF ARCOS ELECTRODES IS NOT AN ACCIDENT

IT'S the result of careful planning, the utilization of scientific methods, and a trained control personnel. If stainless and special alloy electrodes are to deposit a weld metal which is metallurgically and chemically right for the job, more rigid controls are required than for mild steel electrodes. Arcos has specialized in stainless and alloy electrodes for 14 years. During this period, it has developed its own processing to the nth degree of accuracy. When in Philadelphia, let us show you our plant. It will be a revelation to you. It will show you why our statements regarding the high quality of Arcos electrodes are true for every batch and for every run.

Be sure—Buy Arcos.

ARCOS

ARCOS CORPORATION • 304 GULF BUILDING, PHILA. 2, PA.

Your Arcos Distributor is well informed. Your Arcos Distributor has Stock.

AUTOMATIC

- STOCK FEED
- CLAMPING
- WHEEL FEED
- ADJUSTMENT FOR WHEEL WEAR
- EJECTION

...AND HERE'S A TYPICAL JOB

● To finish cut rollers for bearings from 52/100 bar stock to close tolerances. Former method required grinding ends. With this new Model 700 AUTOCUTTER the job is done automatically, one operator running a number of machines. No grinding is necessary.

This line of fully automatic abrasive cutting machines is the solution to many problems of production cutting of short pieces with finished ends and to close tolerances. Model 700 cuts up to ¾" stock—Model 725 up to 2½".

IF YOU HAVE A CUTTING PROBLEM

Write and tell us (1) the range of sizes, (2) kind of material, (3) length of cutoff pieces, (4) length of stock before cutting, (5) tolerance for length of cut pieces and (6) hourly production requirement. With this information, CAMPBELL engineers can recommend production procedure and work up cost sheets for you.

Campbell

ABRASIVE CUTTING MACHINES

ACCO

ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ANDREW C. CAMPBELL DIVISION
AMERICAN CHAIN & CABLE
BRIDGEPORT, CONN.

TRADE MARK

Batcheller Promises Maximum Pressure For Postwar Selling

Pittsburgh

● ● ● "To provide as many jobs as possible, in the interests of your livelihood and that of the communities in which the company's plants are located," Hiland G. Batcheller, president of the Allegheny-Ludlum Steel Corp., told company workers in an annual report to employees, "I am going to do everything within my power, as president of this company, to insure as many orders for our peacetime products as our plant facilities and sales and service abilities can contrive.

"Our entire operation," said Mr. Batcheller, "will benefit in proportion to the amount of employment maintained. Profits and payrolls are shown to go up and down together, hence we are not straddling the fence when we say we are shooting for a high level of both." The report is being mailed to all employees, including almost 5000 in the armed services.

"The competition of new materials, about which so much is heard, does not threaten Allegheny-Ludlum's peacetime production," Mr. Batcheller assured employees. "The uses of stainless and high alloy steels had only made a good beginning, before the war. They have been widely extended during the war, when the advantages of these superior kinds of metal were driven home to industry. That they will find more widespread application after the war is one of the safest prophecies we could make."

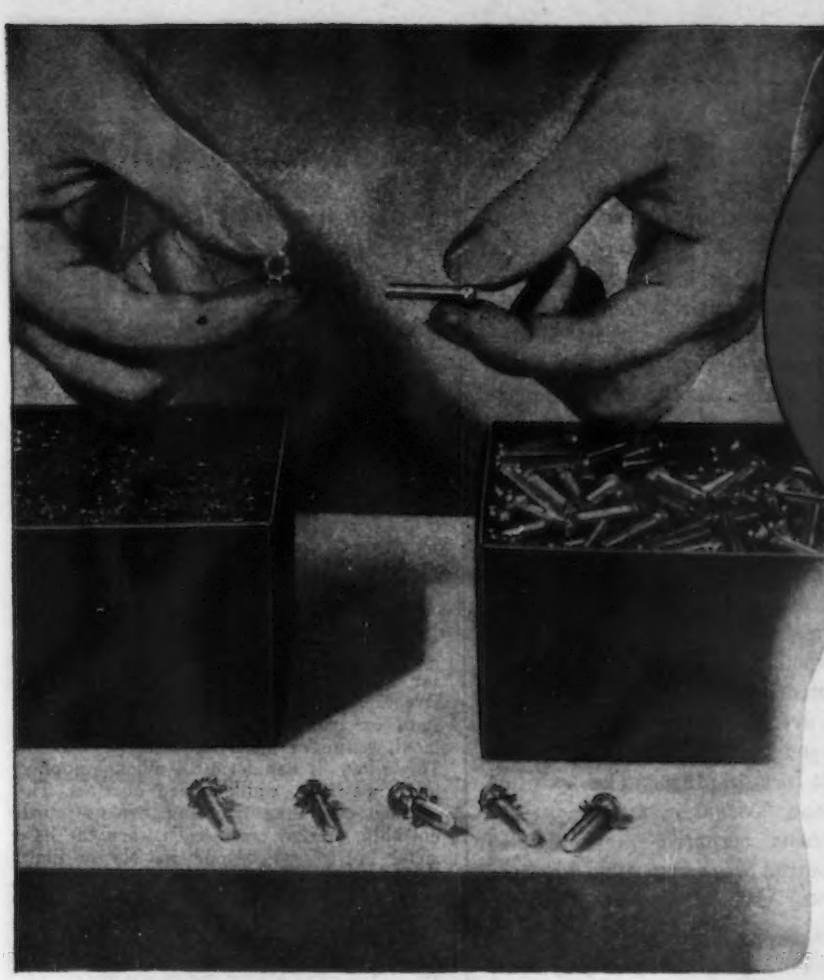
All Metal Personal Planes Now in Production

Dallas

● ● ● Luscombe Airplane Corp. of this city and Trenton, N. J., has completed plans for immediate manufacture here in volume of the first postwar version of its Silvaire all-metal personal airplanes, it was announced recently by Leopold H. P. Klotz, president.

By means of manufacturing facilities already in operation and others nearing completion, Silvaire production by Oct. 1 will be stepped up to exceed considerably the top Silvaire production achieved before the war, Mr. Klotz said. At least 1000 Silvaires are scheduled to be completed here by the end of the year.

The first was completed at the Dallas plant Aug. 12. Additional Silvaires already are under construction on a new assembly line.



How Much IS THIS COSTING YOU?

PUTTING LOCK WASHERS ON SCREWS BY HAND IS NOW AN UNNECESSARY OPERATION . . . SAVE TIME AND MONEY WITH PRE-ASSEMBLED FASTENER UNITS . . . THE LOCK WASHER CAN'T DROP OFF!

SEMS

Trademark Reg. U. S. Pat. Off.

Fastener Units

Also Available With Phillips Recessed Heads

The cost of putting lock washers on screws by hand is considerable . . . it involves labor, overhead, and many miscellaneous expenses. Comparing this with the cost of assembly when Sems Fastener Units are used . . . *proves* that substantial savings can be made.

In addition to lower assembly costs, Sems Units provide better locking power. Every screw is certain to have a Shakeproof Lock Washer* which can't come off, but is free to rotate. Workers can't "forget" the lock washer . . . the unit is easy to handle and assures fast driving.

Let a Shakeproof Engineer show you the cost-saving, product-improving advantages of pre-assembled fastener units. Write today for this helpful service.

**** The famous Shakeproof Lock Washer with the Exclusive Tapered-Twisted Teeth assures your product of positive vibration protection!***

See **FOR YOURSELF WITH THIS FREE TEST KIT!**

Test Sems Fastner Units on your own product. Kit contains a large variety of types and sizes. Write today and ask for Kit No. 231

SHAKEPROOF inc.

Fastening Headquarters

Distributor of Shakeproof Products Manufactured by ILLINOIS TOOL WORKS
2501 North Keeler Avenue, Chicago 39, Illinois
Plants at Chicago and Elgin, Illinois • In Canada: Canada Illinois Tools, Ltd., Toronto, Ontario
Los Angeles Office: 5670 Wilshire Blvd., Los Angeles, 36, Calif. • Detroit Office: 2895 E. Grand Blvd., Detroit 2, Mich.

A few typical styles of Oliver Fasteners

OLIVER

CAP SCREWS

Made by modern methods to close tolerances, Oliver Cap Screws meet your most exacting requirements. Uniformity and accuracy are important qualities of Oliver products that insure faster assembly and dependable joints.

OLIVER IRON AND STEEL Corporation

PITTSBURGH, PENNSYLVANIA

BOLTS . . . NUTS . . . RIVETS
STEEL FASTENERS

Chicago Industrial Jobs Jump 50 Per Cent Since 1939

Chicago

• • • Employment in manufacturing industries in the Chicago industrial area was 50 pct higher when Japan surrendered than it averaged in 1939, the year war broke out in Europe. Nine hundred twenty-five thousand persons were in such employment in the Chicago area as against an average of 616,900 in 1939. Employment in business other than manufacturing in the same period gained by 40,000 persons, bringing the increase in total employment for the area to approximately 350,000. The proportions of employment in manufacturing and in other business, however, were markedly affected by the war, 43 pct of jobs in the area being in manufacturing at the end of the Jap war compared with 34 pct in 1939. The gain of more than 305,000 in manufacturing employment occurred in industries whose output was taken almost entirely for war use.

These facts highlight the preliminary findings concerning employment, the first of a series of statements reporting on a study of the wartime economic changes in the Chicago area and their postwar implications jointly sponsored by the Federal Reserve Bank of Chicago, the Chicago Association of Commerce, and the Chicago Committee for Economic Development. The research is being conducted by Walter E. Hoadley, Jr., industrial economist of the Reserve Bank.

Monarch Earnings Hold

Sidney, Ohio

• • • Net earnings of the Monarch Machine Tool Co., Sidney, Ohio, for the first half of 1945, after all deductions, including Federal taxes, renegotiation and re-pricing of aircraft products, are estimated at $276,889.57, as compared to $261,318.51 for the last half of 1944 and $446,897.95 for the first half of 1944, it was announced by Wendell E. Whipp, president. Shipments for the first half of 1945 were $9,470,492, as compared to $7,035,894.51 for the last half of 1944 and $9,408,477.78 for the first half of 1944.

"As of June 30 of this year, Monarch's backlog of machine tool orders was $5,500,000 as compared to $5,786,000 at Dec. 31, 1944.

(Advertisement)

Let Us Prove Its Advantages on Your Product

GALV-WELD PROCESS

(Patented)

The weld and adjacent damaged area, where the galvanizing burns away at the time of welding, are coated while welding, using the residual heat to flow on Galv-Weld Alloy, permanently insuring

100% PROTECTION AGAINST RUST AND CORROSION

Galv-Welding obsoletes riveted, bolted, soldered construction; lowers costs; makes for stronger, leakproof, vibrationless construction. It produces no fumes, requires no sand or grit blasting, flux, special equipment, set-up or clean up after application. The alloy, in bar form, is quickly applied in all positions and confined quarters. The coating eliminates painting expense: will not chip, peel or crack, even when the base metal is stressed beyond its elastic limit. Fractures in galvanizing, due to forming, are easily coated.

Government approved, with tests showing Galv-Weld equal to and/or better than hot dip galvanizing in corrosion resistance, not only passing standard salt spray requirements of 200 hours, about 8 days, but remaining in test 141 days. Galv-Welded joints have withstood over 8 years' exposure to salt air mists. The process is a must for underground storage tanks. All-welded steel buildings are now practical.

RAILROADS employ it in construction and repair of water tanks, signaling systems, towers and piping.

SHEET METAL WORKERS use it in air conditioning duct systems. It is also especially applicable in refrigerator units.

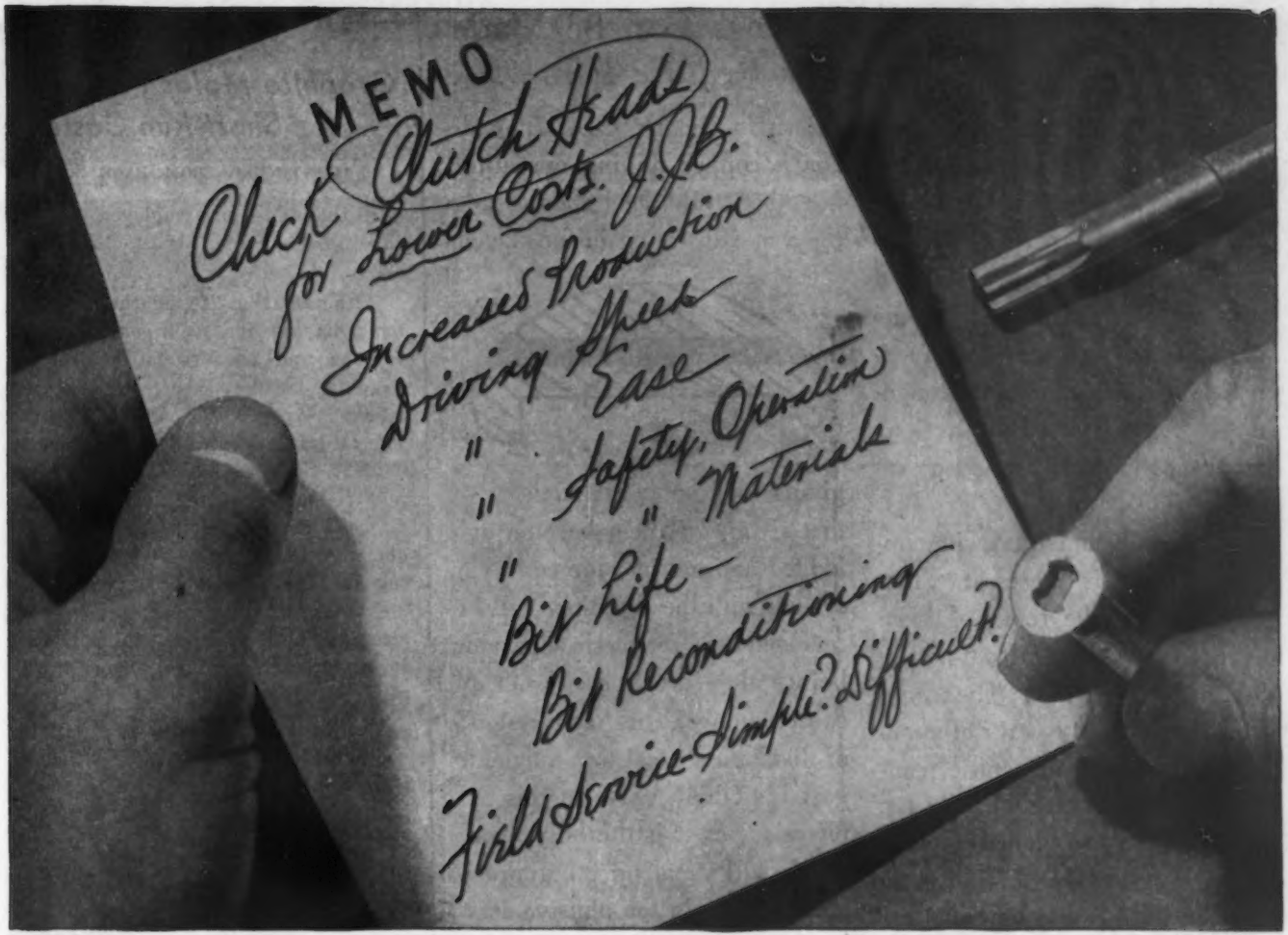
REFINERIES like it because it is not affected by the corrosive acid-bearing fumes in refinery areas.

ELECTRIC POWER COMPANIES are redesigning transmission towers to utilize welded rather than bolted type construction, obtaining greater strength, ease of erection and lower cost. It is used also in the repair of sub-station galvanizing and transformer cases.

SHIPBUILDERS are coating welded seams and joints in pipe, sheets, plates, ventilation ducts, deck houses, water and fuel tanks, sanitary drains, ammunition and ready-service boxes, gallery and baking equipment, sinks and washers, cold storage lockers, inner bottoms and hand rails.

You are invited without cost to submit products for producing examples of Galv-Welding. Further details and sample of Galv-Weld Alloy may be had by writing

GALV-WELD PRODUCTS
Dayton 10, Ohio



TYPE "A" ASSEMBLY BIT

COMMON SCREWDRIVER

Tighten up for Reconversion

The result will show that CLUTCH HEAD Screws have exclusive features and advantages that out-mode all other screws on the market today . . . each a factor that contributes importantly to the *lower final cost* of assembly and servicing.

FOR SPEED . . . Center Pivot entry into the wide roomy Clutch makes straight driving automatic and smooths out slow-down hesitation.

FOR MORE SPEED . . . Driving engagement is all-square. Flat sides of bit contact straight walls of Clutch for effortless, therefore easier and faster, drive home. No ride-out as set up by tapered driving. No fatiguing end pressure to combat. No delay replacing reamed screws and chewed-up heads.

FOR TWO-WAY SAFETY . . . Automatic dead-center entry and positive torque drive (without ride-out) eliminates the slippage hazard . . . protection against injury to manpower and damage to materials.

FOR A NEW LOW IN TOOL COST . . . The rugged Type "A" Bit stands up through long "non-stop" spells, *driving extra thousands of screws* without interruption. Reconditioning to original efficiency requires only a 60-second application of the end surface to a grinding wheel.

SAMPLE SCREWS AND BIT SENT ON REQUEST

FOR BREAKING "BOTTLENECKS" . . A reverse turn of the Type "A" Bit in the Clutch recess forms the Lock-On, uniting screw and bit as a unit for easy one-handed reaching to hard-to-get-at spots. Lock-On is automatically released by normal driving of the screw.

CLUTCH HEAD SCREWS

FOR SIMPLIFIED FIELD SERVICE . . This is the only modern screw basically designed to operate with an ordinary type screwdriver. With a Type "A" driver, the Lock-On feature permits the withdrawing of screws undamaged and held safely for re-use.

UNITED SCREW AND BOLT CORPORATION

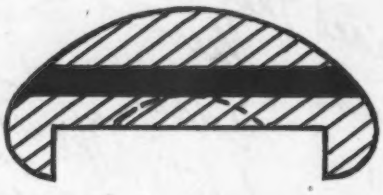
CHICAGO 8 CLEVELAND 2 NEW YORK 7

How Manganese Steel Castings Can Be Made Magnetic *When Conditions Require It . . . . . .*

Austenitic manganese steel has been widely accepted as a material for applications requiring the combined properties of resistance to shocks and abrasion, and non-magnetism. However, some cases are encountered where magnetism is essential, and the toughness and wear resistance of manganese steel are also required.

In mining and quarrying operations, it is necessary that "tramp iron" be removed from the ore, stone, clay or coal before it reaches the crusher. The tramp iron may include parts of manganese steel. An austenitic manganese steel casting will not respond to the magnetic separator. However, the non-magnetic character of manganese steel castings can be, in effect, offset by "casting in" pieces of an ordinary steel that responds to magnetism.

The 24 tons of Amsco manganese steel grizzly bar caps shown in Picture C-8767, made for a copper mining operation, have had mild steel rods cast in them as illustrated in the sketch,



giving sufficient magnetism so that if any of them become dislodged and get into the conveyor system with the ore, they will be removed by a magnetic separator before they reach a crusher to cause damage. This "conversion" of manganese steel to a magnetic part is of high value in this application, as it is the only metal which will stand up for appreciable periods in the abusive service to which grizzly bar caps are continuously subjected.

Send for Bulletin 1144-NM, "Non-Magnetic Applications of Amsco Manganese Steel."

Important part played by Amsco Power Shovel Dippers in Mining Told in Bulletin 641-D.

Amsco
AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Illinois
FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO.
OFFICES IN PRINCIPAL CITIES

AMERICAN Brake Shoe COMPANY

FEATURE CONTINUATION

Graphite Molds For Short-Run Castings

(CONTINUED FROM PAGE 85)

with the man-hours employed in shaping metallic materials in other processes.

Although the life of the graphite mold may be limited in comparison to ferrous and nonferrous metals, the graphite does not need to be scrapped when it is eroded. As son as the effects of mechanical wear become evident, the same die can be taken out and re-machined to the next larger size. With care, molds can be bored out and used for successive sizes varying in diameter by as little as one eighth in. If the proper sequences of sizes is planned, the cost of mold material for each casting becomes negligible.

The heat conductivity of graphite rod is an important feature. Although it is less than that of steel, iron or bronze, it is sufficient to distribute heat uniformly and rapidly through the mold. The rod readily assumes casting temperatures when the mold is preheated with an ordinary gas torch, or when a dummy casting is made of molten metal.

Freedom from growth and solid oxidation products and low expansion coefficient in graphite molds combine to prevent formation of surface cracks, which cause imperfect casting surfaces and promote mold erosion. Since mold material must absorb and dissipate the heat from the casting, the mold wall thicknes is a matter of prime importance. In moderate production, satisfactory results are obtained when the thickness of the graphite mold wall is equal to, or preferably greater than, the thickness of the casting wall. For practical reasons, the mold wall should not be less than 1 in. There is preference for a heavy wall to reduce freezing-time ratio of the pouring cycle and to increase the number of pieces per mold. Use of a thick wall is governed by the fact that the mold must absorb heat rapidly from the freezing casting, while the dissipation of heat to the air and the rotating flask is slow. If insufficient heat storage capacity is available, the casting cools too slowly and some desirable properties are lost.

In thin-wall molds, erosion is supplemented at excessive temperatures, produced by oxidation of the outer

Contact KAYDON *of Muskegon*

FOR ALL TYPES OF BALL AND ROLLER BEARINGS 4" BORE TO 120" OUTSIDE DIAMETER

The huge spindle of this 13-ton SMALLEY-GENERAL Thread Miller runs in Special KAYDON Tapered Roller Bearings, 24 x 30 x 2.125".
THE NO. 44 MB SMALLEY-GENERAL MASTER THREAD MILLER USES KAYDON PRECISION TAPER BEARINGS

Companions in QUALITY *and* PRECISION

WITH its 18½" hole through main spindle, and with sufficient swing to take care of 8" Howitzers, 155 m/m and 4.7 guns, this SMALLEY-GENERAL machine is milling threads formerly considered impossible . . . up to 1" pitch, 34" inside and 24" outside diameters!

Teaming up with thread-miller engineers of the Smalley-General Company, KAYDON made the special high-precision tapered roller bearings with a very thin cross section, which presented unusual problems in accuracy. This successful teamwork is typical of progress that can be achieved by experienced "companions in quality and precision".

KAYDON, specializing in engineering and production of all types and sizes of ball and roller bearings from 4" bore to 120" O.D., also offers complete facilities for atmospheric controlled heat treating, flame hardening, precision heat treating, salt bath high speed tool hardening, microscopy, physical testing, and metallurgical laboratory services.

Counsel in confidence with KAYDON. Capacity is available now for production of all types and sizes of KAYDON Bearings. Look ahead — plan ahead — with KAYDON.

KAYDON *Types of Standard or Special Bearings:*
Spherical Roller • Taper Roller
Ball Radial • Ball Thrust
Roller Radial • Roller Thrust

THE KAYDON ENGINEERING CORP.

MUSKEGON . MICHIGAN

New in Name . . . Old in Experience

Saves the extra cost of a special machine

... by adapting a standard Delta tool

This manufacturer benefits from an ingenious, money-saving production idea, typical of what you can do along these lines:

1. Use standard, low-cost Delta components to build high-production, special-purpose machines — quickly convertible to other uses when requirements change.
2. Modernize your present machines that are rapidly approaching obsolescence, by replacing worn elements with regular, stock-model Delta components.
3. Utilize the portability and compactness of Delta-Milwaukee Machine Tools, to revise or supplement production-line layouts for more efficient operation.

This is representative of production ideas that get results in hundreds of plants which employ Delta's modern, flexible approach to tooling, on a wide variety of operations.

Delta's savings in cost, weight, and space are due to modern production methods applied to a large volume of standard models — not to short-cuts in quality.

Low-cost Delta-Milwaukee Machine Tools and the ingenuity of your engineers provide a working combination that results in fast, flexible, economical solutions to production problems.

Delta MILWAUKEE Machine Tools

● By adding a special fixture to a standard Delta-Milwaukee Shaper, J. I. Case Co., Rockford, Ill., solved the problem of shaping magneto timing cams without the delay and heavy capital investment involved in installing an elaborate special machine for the purpose.

Using minimum floor space, this ingenious set-up accurately shapes cams to exact tolerance of .0005". Thus a $35.00 machine does a job ordinarily done by a grinding machine usually costing about $1500.00. The addition of a special fixture is required in either case, so the fixture cost remains the same. MA-23

Delta's 76-page Blue Book provides 140 case histories of war-production experience, to help you more clearly visualize the flexibility of portable, compact Delta-Milwaukee Machine Tools. Also available is a catalog of these low-cost machine tools. Request both, using coupon below.

Tear out coupon and mail today!

THE DELTA MANUFACTURING CO.
704K E. Vienna Ave., Milwaukee 1, Wis.

Please send me my free copies of Delta's 76-page Blue Book and catalog of low-cost machine tools.

Name_____

Position_____

Company_____

Address_____

City_____ (____) State_____

mold surface. As a result, life of these molds is shorter than that of molds of sufficient thickness.

No special mold washes are necessary. To date, liquid preparations have been unsatisfactory due to permeability of the graphite rod. Water in form of steam is forced into the air spaces. Steam reconverges and creates gas pockets on the casting surface. Perhaps the best method used in prolonging the life and improving casting appearance of the mold is the application of bentonite. This clay is blown in axially, or dusted on the mold surface, and does much to cushion the metal heat and retain a good surface. In the majority of cases, a fraction of an ounce of bentonite is sufficient; the coat must be kept light. When the proper amount is used, the bentonite is automatically taken out with each casting.

Taper is normally used to facilitate casting removal and to increase mold life; however, much depends on the design of the casting, the types of metal, and the length of casting cycle. Simple cylindrical castings do not require taper for short lengths, since heavy molds are used and heat storage of the mold is sufficient to cool the casting to a point where shrinkage facilitates removal. Castings with beveled, conical or pyramidal shapes are adapted to molding without taper.

Phosphorous copper used as a deoxodizer in tin bronzes tends to build up on graphite and "wet" the mold surface. Although aided by the difference in coefficient of expansion of metal and mold the extraction process becomes difficult. This disadvantage is readily overcome by the proper amount of taper.

Centrifugal castings do not require the large fillets used in static process, nevertheless radii can be used to advantage. Sharp corners tend to break down at elevated temperatures. This fragility at high temperatures increases mechanical wear caused by extracting the casting from the mold. Consequently a slight radius placed at the corners of the mold improves considerably die-life.

A graphite mold is not limited to use of a single piece; design possibilities are numerous. As shown in fig. 1, there are many possibilities in the cope-and-drag type casting with satisfactory results in production and mold life. It must be remembered that although graphite rod can stand extraction abuse, it has not the strength of the metallic materials.

SAVE Time··Effort··Money

Automatic End Dump

Item S-878

For handling and dumping sand, castings, scrap, stampings and other heavy materials. Fits any fork or lift truck. Built of heavy steel plate reinforced with heavy angles. All welded construction. Rockers, geared to truck, are self-seating and smooth operating.

TWO STANDARD SIZES

	S-878-A	S-878-B
Capacity	½Cu.Yd.	1Cu.Yd.
Overall Length	45″	66″
Overall Width	36″	36″
Overall Height	42½″	46½″
*Floor Clearance	12″	12″
Space Bet. Legs	29½″	29½″
Approx. Weight	600 lbs.	750 lbs.
Finish	P.S.Gray	P.S.Gray
Price	$85.00	$95.00

*Can be supplied with any other floor clearance if specified when ordering.

Item B-339-A $25.00
Plain bearing metal wheels

Item B-339-B $27.50
Roller bearing metal wheels

Item B-339-C $32.50
Rubber tired roller bearing wheels

Shovel Truck

For pick-up and moving barrels, hampers or cases; sturdily constructed and easy wheeling. Overall height 48″. Heavy steel nose plate, 19″ wide at base, 13″ wide at front. All welded construction. Two 6″ diameter wheels. Convenient shaped handles of heavy 1½″ O.D. tubing. Weight 50 lbs.

Item NS-298
$46.50

Hand Dump Truck

Constructed of heavy sheet steel, reinforced with band at top edge, stout ⅝″ round rod iron handle welded to truck. This truck measures 25¾″ by 45″ at the top and 25¾″ by 27″ at the bottom by 17½″ deep—carries about ½ cu. yd. and weighs 125 lbs. Equipped with two 8″ semi-steel wheels and two 4″ metal swivel casters.

Item NS-288
$55.25

Barrel and Box Grab

For picking up any type of wood or steel barrel, box or container, from 40″ diameter down to small nail keg size. Capacity, 1-ton. Weight 35 lbs.

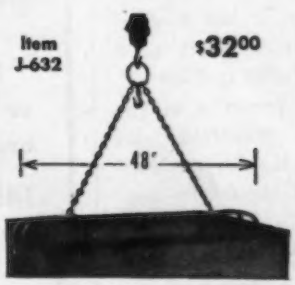
Barrel Truck

Handles with ease barrels weighing up to 1,000 lbs. Weighs but 85 lbs. To load, shove truck up against barrel or drum, then drop sliding steel catch over rim . . . pull toward you and truck loads automatically without rocking or tugging—loads from row as easily as when barrel stands alone.

Sturdily constructed of heavy steel, two 10″ roller bearing wheels. Greatest width only 22″, permitting it to pass through aisles and doors too narrow for many trucks.

Item S-911-M $33.50
Equipped with metal wheels

Item S-911-R $38.50
Equipped with molded-on rubber wheels



Item J-632 $32.00

Universal Grab

Use for picking up all types of heavy boxes, crates, bales or other loads where hooks may be used. Heavy, forged steel hooks with an adjustable spread of from 16″ to 48″. Adjustable for use where ceilings are high or low. Sturdy ¾″ BBB chains. Weight 27 lbs.

Item B-289-1

Spike Type Box Grab

For grabbing and lifting large, heavy boxes where the use of spiked grips is allowed. Gripper plates are fitted with replaceable cone-headed spike bolts. Model shown has 1000-lb. capacity; can be used on boxes up to 5 feet wide. Larger models are built proportionately heavier. Four sizes:

Item B-289-1 Cap. 1000 lbs. $37.50

Item B-289-2 Cap. 2000 lbs. $52.75

Item B-289-3 Cap. 3000 lbs. $68.25

Item B-289-4 Cap. 4000 lbs. $95.00

Item S-703 $14.75

Industrial Dust Pan

No shovel to bother with. Moves around in places too tight for a wheel-barrow. Very light to handle. Weighs only 45 lbs. Capacity one bushel. Exceptionally well constructed to withstand rough treatment in industrial plants.

The pan or metal basket which measures 18″ x 18″ x 18″ is made of 16 gauge sheet steel, the frame of 1″ x 1½″ x ⅛″ angle iron, the handle of 1″ tubing, all welded construction. The overall height is 48″. Two 8″ rubber tired, ball bearing wheels.

Item NS-364
$150.00
Complete as shown

Sheet Steel Grab

For handling sheet steel in bundles of any size lift up to 9″ thick, 18″ to 48″ wide, and any length. "Grabs" can be used single, double or triple according to size of bundle; illustration shows triple application. Capacity, one ton per "grab"—total, 3 tons. Holds sheets securely without slippage, distortion or damage to stock. Suited to high or low head room. Supporting beam measures 6′ long. Heavily constructed. Weight 190 lbs.

Item NS-415

Utilities Rack on Wheels

$55.50

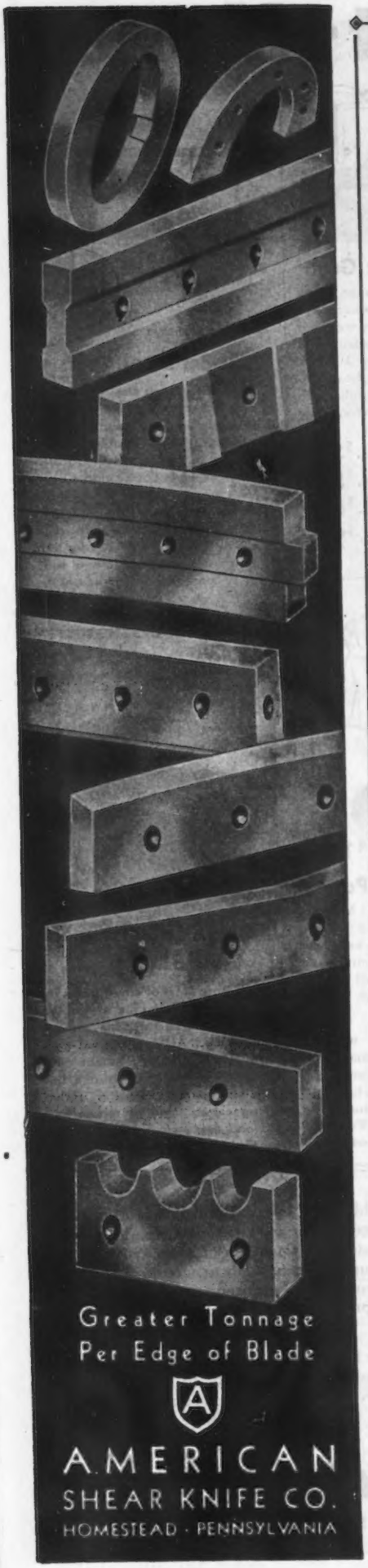
For handling parts or small items in course of production or assembly. Use at machine and also for conveying materials. All steel welded construction. Width 24″, height 50″, length 48″ overall. Clearance between shelves 12″. Four 6″ roller bearing casters, two of which are rigid and two swivel. Weight 220 lbs. Finish P.S. gray.

Designers and builders of every conceivable type of materials handling equipment . . . for pick-up, loading, moving, dumping or storage . . . made of metal, or wood, or combination. Tell us what you wish to accomplish, and we shall gladly offer you our recommendations and quote you on handling equipment designed to fit your plant and your product.

NOTE:—Always order by "Item" number, this will prevent error. Accompany orders with priority to avoid delay. All prices f.o.b. Detroit. All weights are approximate. Finish is standard P.S. gray unless otherwise noted.

Palmer-Shile Co.

784 So. Harrington St., DETROIT 17, MICHIGAN



FEATURE CONTINUATION

Though the material becomes fragile at elevated temperatures, graphite rod can be worked satisfactorily below "red heat." It has the advantage of light weight—a piece 6 in. in diam by 1 in. in thickness weighs approximately 1.6 lb. Maximum economy in use of graphite rod can be obtained by using two pieces of worn molds to make a single large casting. Small plugs can be inserted into a worn mold to make castings of small diameter.

Insulating materials have been inserted into the "hot spots" on permanent molds. Hot spots are places in the mold which take the brunt of the first metal entering the mold. This factor is lessening life of metallic molds. To overcome the effect of thermal shock and the breaking down of the mold in this weak spot, sand plugs have proved successful. Sand must be replaced for each casting, however, and graphite is now being investigated as a possible substitute to serve as a semi-permanent pad.

In view of better controls being introduced and more complicated shapes being cast centrifugally, the advantages of graphite rod should not be overlooked.

Briefly, they are:

(1) Less storage space.
(2) More easily machined with normal carbon steel.
(3) Versatility and light weight.
(4) Economy, particularly for casting orders up to 500 pieces.
(5) Rapid heat transfer to aid progressive solidification.
(6) Ready availability.

With more research there is a real possibility of producing graphite inserts that may be placed in molds to eliminate machining operations as hole boring. Undercuts and irregular contours will eventually be cast rather than machined. Though the graphite rod has some limitations in use with metals that require high melting and pouring temperatures, it has worked well with metals that normally need not be poured above 2000° to 2300° F. The opportunities it presents in the nonferrous field are manifold, and future possibilities in the ferrous centrifugal casting field should be continually studied.

Nash-Kelvinator to Expand

Detroit

• • • **Nash-Kelvinator** Corp. has announced a $2,400,000 expansion program at Grand Rapids, anticipating moving the entire final refrigerator assembly there from Detroit.

Plant where photo was taken stamped over 2,000,000 before Pearl Harbor. Dies still good.

WHEN YOU SWING BACK TO CIVILIAN PRODUCTION

Start your tooling program right —specify Strenes metal for all your drawing and forming dies. It can be cast to shape (usually to 1/10"). It will reduce machining time ⅓ to ½. It will stamp far more parts between redressings than conventional dies. It is *guaranteed uniform in metallurgical structure and physical properties because only the home plant casts Strenes metal.* No licenses.

Ask almost any manufacturer of cars, trucks, tractors, refrigerators, stoves for their confidential opinion of Strenes dies. We'll gladly furnish names of men to contact.

Better still, order one trial casting. No charge if claims not borne out. That puts it up to us.

THE ADVANCE FOUNDRY CO.
100 Seminary Ave.
Dayton 3, Ohio.

STRENES METAL
DRAWING AND FORMING DIE METAL

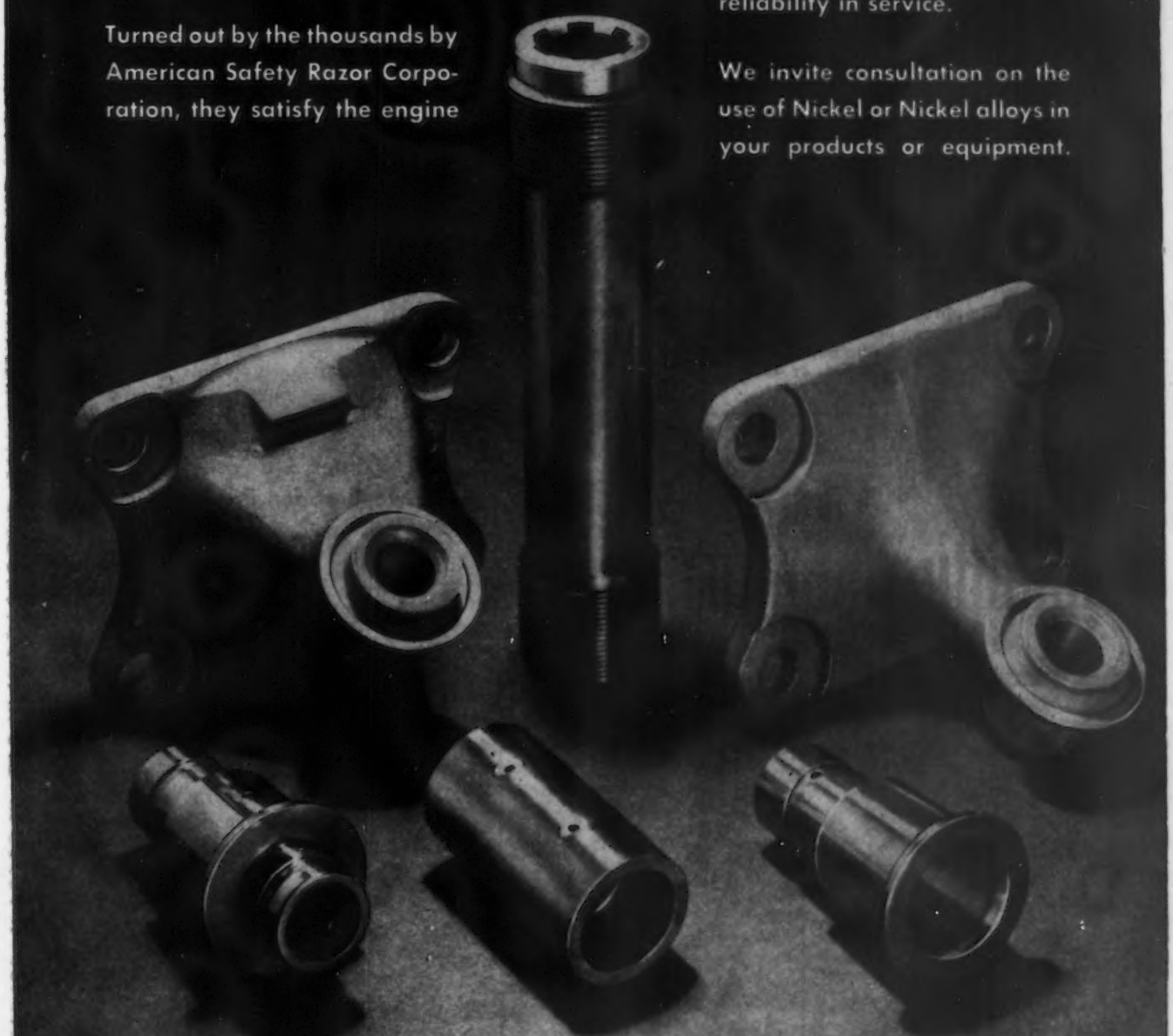
NICKEL ALLOY STEELS

Provide Essential Dependability

These Nickel steel parts for aircraft engines meet the rigid requirements and specifications of the Army Air Forces.

Turned out by the thousands by American Safety Razor Corporation, they satisfy the engine builders' demands for high mechanical properties, minimum distortion after heat treatment, close tolerances and thorough reliability in service.

We invite consultation on the use of Nickel or Nickel alloys in your products or equipment.



THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

MACHINE TOOLS

. . . News and Market Activities

French Plan to Replace 265,000 Tools in Comprehensive 5-Year Program

Washington

• • • The French Ministry of Industrial Production, through its Mechanical Industries Division, has prepared a five-year plan for the rehabilitation of the French machine tool industry, according to the Dept. of Commerce.

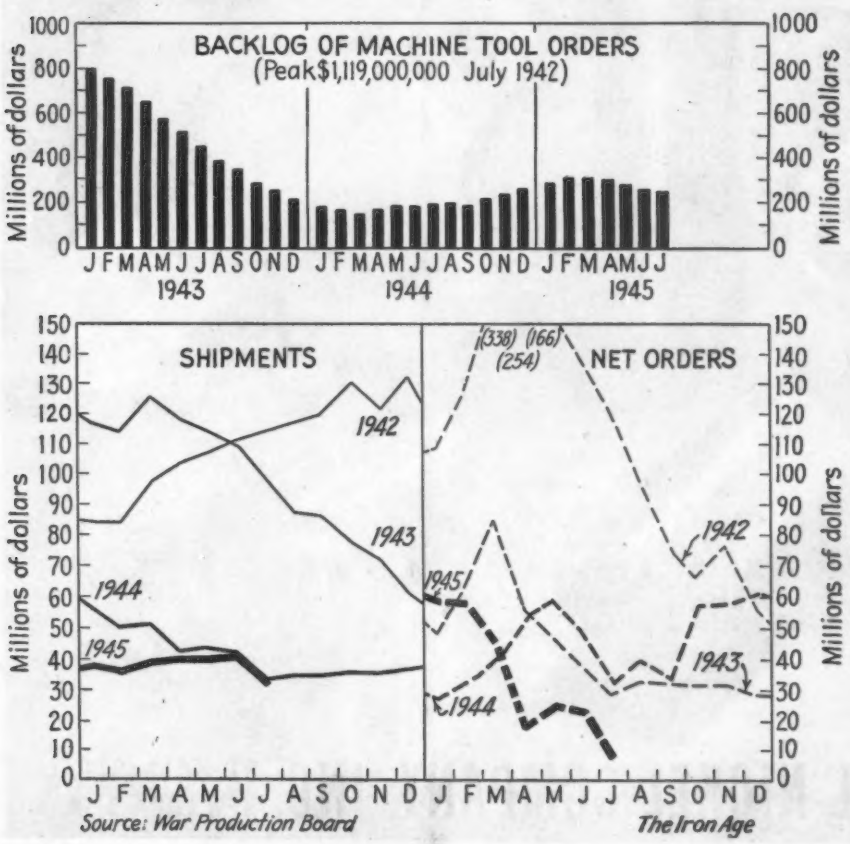
The principal points of the plan are reported to be: The maintenance of the total usable stock of machine tools at the prewar figure of 590,000 units; the replacement of 265,000 of the oldest units by new machines at a cost according to present estimates of about 70 billion francs—about 125,000 units are expected to be imported from Great Britain, the United States, and Sweden, or recovered from Germany; gradual reduction over the 5-year period of the average age of machine tools from 25 to 12 years.

This process, involving the replenishment of nearly half the supply of machine tools by modern high-output units, would make possible considerable increase in production capacity of the French machine tool industry.

One of the principal features of the plan is the construction of more than 120,000 machines in France, in series, according to the following schedule: 16,000 units the first year; 21,000 units the second; 25,000 units the third; 30,000 units the fourth; and 30,000 the fifth. Estimated expenditures for execution of this portion of the program would be 30 billion francs.

The Ministry envisages the grouping of the principal French manufacturers of machine tools into a new combined company, in which the government would have the maximum share of capital, charged with the production of certain types of machine tools heretofore imported. The organization could acquire patents covering machines already perfected and in production.

• Shipments of machine tools in July, as reported by 198 companies, amounted to $32,521,000, as compared with $41,040,000 in June, a decrease of 20.8 pct, according to a preliminary report issued by the Tools Div. of the War Production Board. The decrease was attributed by the division primarily to Independence holiday. Curtailment of lend-lease and foundry bottlenecks were given as additional contributing factors. Net new orders also declined, with the cutting off of lend-lease given as one of the principal reasons. The value of such orders, according to the report, was $7,627,000, or 33 pct below June. As an additional explanation of this decrease, the Tools Division said that miltary requirements are being met, in some cases, from surplus. Unfilled orders decreased to $240,335,000, or 6.4 pct from June. At the current rate of shipment, the division said, it will require approximately seven months to ship orders on hand as of the end of July. The number of workers engaged in the industry during July decreased approximately one pct to 54,400. As compared with July 1944, however, the decrease was eight pct, or 4300.


BACKLOG OF MACHINE TOOL ORDERS
(Peak $1,119,000,000 July 1942)
Millions of dollars
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J
1943
1944
1945
SHIPMENTS
NET ORDERS
1942
1943
1944
1945
(338) (166) (254)
J F M A M J J A S O N D J F M A M J J A S O N D
Source: War Production Board
The Iron Age

Warner & Swasey Plans To Broaden Product Line

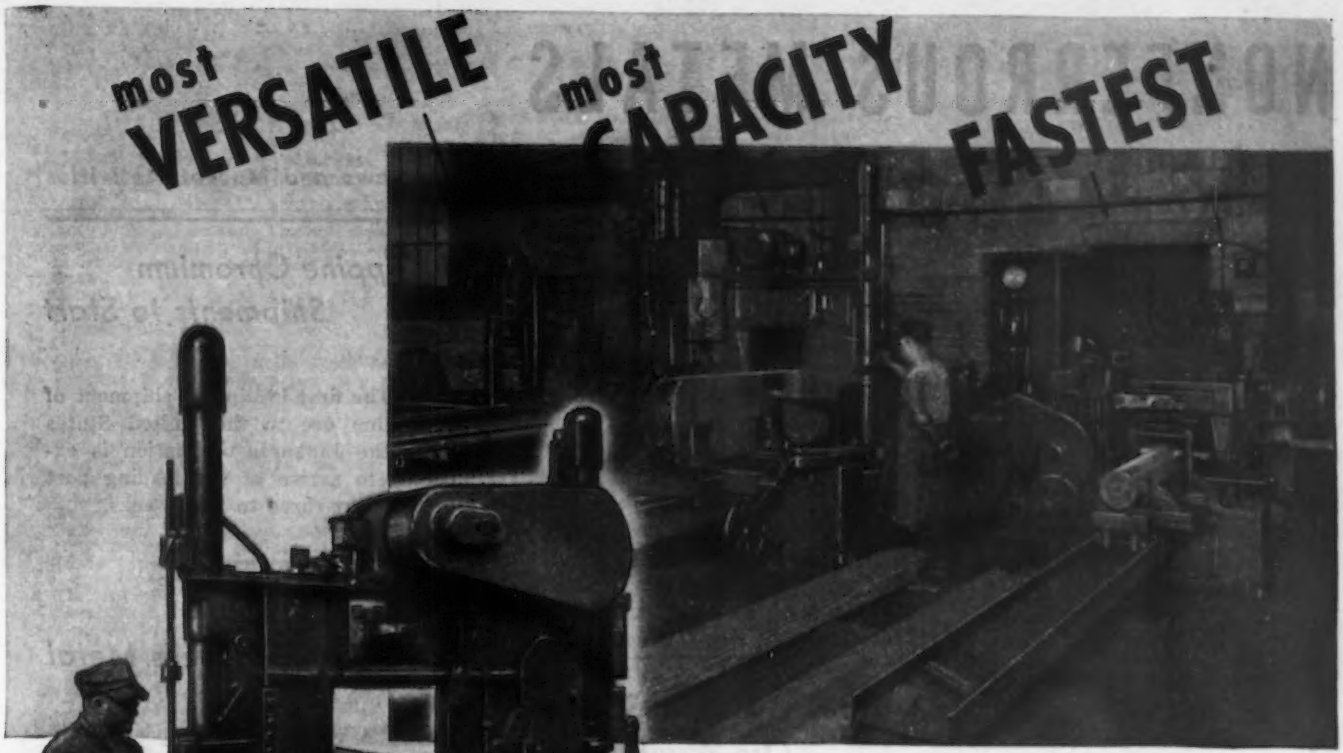
Cleveland

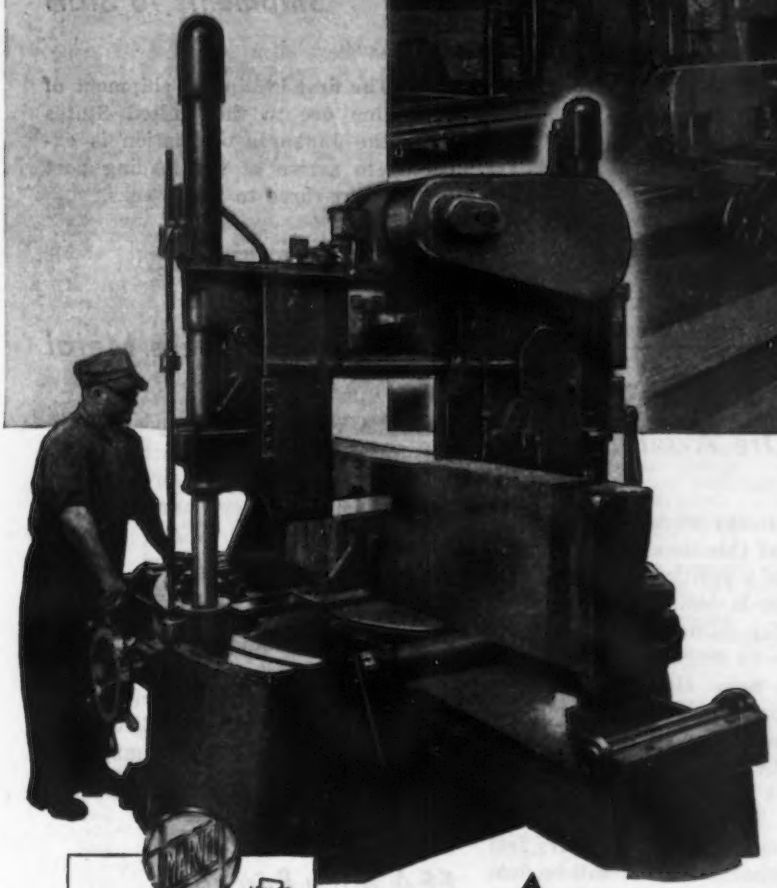
• • • As the first step in a long-term program of product diversification, Warner & Swasey Co., Cleveland, is entering the textile machinery field, it was announced recently by Charles J. Stilwell, president of the company.

Builders of machine tools, chiefly turret lathes, for over sixty years, the company expanded and broadened its facilities, to meet the war demand, considerably beyond peacetime requirements for machine tool manufacture.

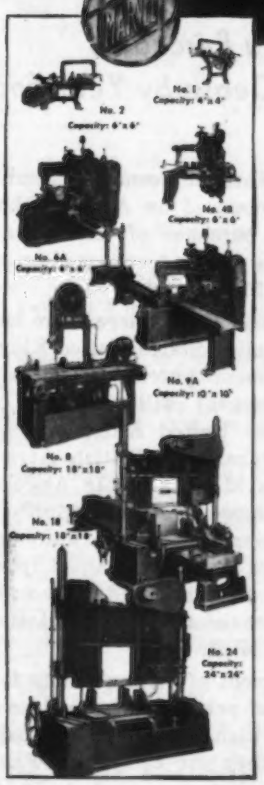
"Our new product program," Stilwell said recently, "is planned not merely for the purpose of utilizing our expanded facilities, but also as a protection against the extreme fluctuations which are peculiar to the machine tool industry, and the impact of the forthcoming sales of Government-owned machine tool surpluses."

most VERSATILE most CAPACITY FASTEST





EACH *first* IN ITS CLASS



AT the Braeburn Alloy Steel Corporation, Braeburn, Pennsylvania, there is a lot of steel to be cut—not only in tonnage but in types of steels, variety of cuts and range of sizes. Still the Braeburn Corporation can give prompt cutting-off service on any order, whether it be for a single tool steel flat, a thousand gear blanks or a giant die block (up to 18" x 18" cross section). They have equipped their cutting-off department to handle every type cutting-off job with a MARVEL No. 8 Metal-cutting Band Saw, by far the most versatile saw built; a MARVEL No. 9A Automatic Production Saw, by far the fastest saw; and, a MARVEL No. 18 Giant Hydraulic Saw—which, with the exception of its larger "sister" the MARVEL No. 24 (capacity 24" x 24"), is the largest capacity hack saw built. With this battery of modern sawing equipment this firm gets the utmost in Speed, Accuracy and Economy, no matter what the job calls for. Furthermore, because of the automatic features of these saws, one operator takes care of all 3 of them.

No matter what your sawing needs, from the most inexpensive dry cutting shop saw to the largest capacity giant, there is a MARVEL Saw exactly suited to your needs and it's the best saw of its type.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 W. Bloomingdale Ave. Chicago 39, U. S. A.

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL SAWS

NONFERROUS METALS

. . . News and Market Activities

French Protest Seizure Of Bor Copper Mines

Paris

• • • **The French government** will lodge protests with Yugoslavia against the nationalization of the French-owned Bor copper mines, the largest European copper holdings, without compensation.

More than half of these shares are said to have been in the occupied part of France and were taken over by the German administrator. However, the Yugoslavs took over the Bor mines last October and have been operating them even since under the control of a workers' committee. The mines are being operated at less than 25 pct capacity and all French employees have been sent home. The Bor concession was granted to the French company in 1903 to remain valid until 1960.

The British government is said to be intending to make similar representations as to Yugoslav nationalization of the British Trepca lead and zinc mines which were never under German domination.

Limit Antimony Content In Storage Batteries

Washington

• • • **Order M-38,** which restricts the delivery and controls the use of lead, lead products and lead scrap has now been amended to limit the antimonial lead that may be used for storage batteries to 9 pct antimony content, except where specified for contracts for the Army or Navy, the Maritime Commission, or the War Shipping Administration in which an alloy with a higher content of antimony is mandatory.

Expect OPA Release Of Foreign Silver

New York

• • • **Silver dealers** anticipate that the OPA will release price control of foreign silver in the next few days, for all supplies of imported silver were disposed of within a day or two after the relaxation of Order M-189 several weeks ago. With our price ceiling, foreign countries are unwilling to sell us silver and the trade believes that with the release of price control this silver will quickly reach the price level of treasury silver. Fabricating mills are busy at the moment with military metals and insignia being produced now in quantity since the end of the war. Dealers do not have a stock of open market silver largely due to the fact that while under control it was required principally for electrical contacts and brazing. Therefore, there was no necessity to establish a sizable inventory.

Antimony Metal Scarce; Ore Available Here

New York

• • • **Antimony metal** is all but unobtainable at this time with dealers in the metal in a position to supply only the ore. It is believed that use of antimony for flame proofing canvas and paint is no longer active since the end of the war. However, it is not expected that Chinese antimony will be imported within any reasonable time and the only domestic producer is the Texas Mining and Smelting Co. at Laredo, Tex., which is operating on Latin-American ores. Dealers feel that the antimony market will be firm at least for the next three or four months.

Mercury Drops Again

New York

• • • **Another drop** has occurred in the mercury market this week with flasks selling at $110 to $115 delivered New York depending upon quantity. Buyers are holding back purchases anticipating an even greater decline to come. It is believed by the trade that all military contracts have been cancelled for the mercury containing tropical battery.

Cobalt Easier Now

New York

• • • **The cobalt market** is somewhat easier now that the war is over and, in contrast to activities in June, the industry is considering future marketing prospects rather than the supply situation.

Philippine Chromium Shipments to Start

New York

• • • **The first Philippine** shipment of chromium ore to the United States since the Japanese occupation is expected to arrive at the loading port in the next three to four weeks.

Reduce Price Of Manganese Metal

New York

• • • **A reduction** of 4¢ per lb to a bulk price of 32c per lb in the maximum 2.00 pct iron grade of manganese metal has been announced by Electro-Metallurgical Sales Corp., unit of Union Carbide and Carbon Corp., effective Sept. 1. The maximum 2.50 pct iron grade will be discontinued and all shipments of electromet manganese metal will now conform to the following specification: Manganese 96.00 pct min, silicon 1.00 pct max, carbon 0.20 pct max, iron 2.00 pct max.

FEA Mica Purchases To Cease by Year End

Washington

• • • **The Foreign Economic** Administration announced on Aug. 29 that government purchase of mica in all foreign areas will be terminated on or before Dec. 31.

In Brazil and India where there has been joint United States-United Kingdom government purchases, government procurement will cease as of Nov. 30. The United Kingdom government purchases in British Africa will cease as of Dec. 31. In Angola, private purchases are now permitted, but permission to import into the United States must be obtained from the War Production Board in accordance with provisions of General Imports Order M-63.

Announcement of arrangements for resumption of private trade in Brazil, India and British Africa will be made as soon as they are completed, FEA said.

Primary Metals

(Cents per lb., unless otherwise noted)

Aluminum, 99+%, del'd (Min. 10,000 lb.)	15.00
Aluminum pig	14.00
Antimony, American, Laredo, Tex.	14.50
Beryllium copper, 3.75-4.25% Be; dollars per lb. contained Be	$17.00
Cadmium, del'd	90.00
Cobalt, 97-99% (per lb.)	$1.50 to $1.57
Copper, electro, Conn. valley	12.00
Copper, electro, New York	11.75
Copper, lake	12.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.8%, dollars per troy oz.	$3.00
Iridium, dollars per troy oz.	$120.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9 + %, carlots	20.50
Magnesium, 12-in. sticks, carlots	27.50
Mercury, dollars per 76-lb. flask, f.o.b. New York	$110 to $115
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per oz.	$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.65

Remelted Metals

(Cents per lb. unless otherwise noted)

Aluminum, No. 12 Fdy. (No. 2)	9.00 to 10.00
Aluminum, deoxidizing No. 2, 3, 4	$6.00 to 9.50
Brass Ingot	
85-5-5-5 (No. 115)	13.25
88-10-2 (No. 215)	16.75
80-10-10 (No. 305)	16.00
No. 1 Yellow (No. 405)	10.25

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.37	....	20.37
Copper, H.R.	....	17.37	....
Copper drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....	....	19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercial bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	23.00
Phos. bronze, A, B, 5%	....	26.50	26.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	....

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier: 2S and 3S, 21.3c.; 52S, 24.2c.; 61S, 22.3c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness: 2S and 3S, 22.7c. a lb.; 52S, 26.3c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base, 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price; 17ST and 11SF-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ⅜ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals; ¼ in., 34½c. per lb.; ⅜ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 34c. per lb.; ⅜ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 99 lb., 56c.; less than 25 lb., 66c.

NONFERROUS SCRAP METAL QUOTATIONS

†*(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums—other prices are current quotations)*

Copper, Copper Base Alloys

OPA Group 1†

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	8.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2†

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Contaminated gilded metal solids	8.00
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25
Automobile radiators	7.00
Zincy bronze borings	8.00
Zincy bronze solids	8.00

OPA Group 3†

Fired rifle shells	8.25
Brass pipe	7.50
Old rolled brass	7.00
Admiralty condenser tubes	7.50
Muntz metal condenser tubes	7.00
Plated brass sheet, pipe reflectors	6.50
Manganese bronze solids	7.25[1]
Manganese bronze solids	6.25[2]
Manganese bronze borings	6.50[1]

OPA Group 4†

Refinery brass	4.75*

*Price varies with analysis. [1]Lead content 0.00 to 0.40 per cent. [2]Lead content 0.41 to 1.00 per cent.

Other Copper Alloys

Briquetted Cartridge Brass Turnings	8.62½
Cartridge Brass Turnings, Loose	7.87½
Loose Yellow Brass Trimmings	7.37½

Aluminum

Plant scrap, segregated

2S solids	8.00
Dural alloys, solids 14, 17, 18, 24S 25S	4.50
turnings, dry basis	3.00
Low copper alloys 51, 52, 61, 62S solids	7.50
turnings, dry basis	5.75

Plant scrap, mixed

Solids	4.00
Turnings, dry basis	2.75

Obsolete scrap

Pure cable	8.00
Old sheet and utensils	6.00
Old castings and forgings	5.00
Pistons, free of struts	5.00
Pistons, with struts	3.00
Old alloy sheet	5.00

Magnesium*

Segregated plant scrap

Pure solids and all other solids, exempt	
Borings and turnings	1.50

Mixed, contaminated plant scrap

Grade 1 solids	3.00
Grade 1 borings and turnings	2.00
Grade 2 solids	2.00
Grade 2 borings and turnings	1.00

*Nominal.

Zinc

New zinc clippings, trimmings	6.50
Engravers, lithographers plates	6.50
Old zinc scrap	4.75
Unsweated zinc dross	5.00
Die cast slab	4.50
New die cast scrap	4.45
Radiator grilles, old and new	3.50
Old die cast scrap	3.00

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead including cable, for f.o.b. point of shipment price.

Nickel

Ni content 96+%, Cu under ½%, 26c. per lb.; 90 to 95% Ni, 26c. per lb contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point in 500 lb lots)

Copper, frt. allowed	
Cast, oval, 15 in. or longer	25½
Electrodeposited	18½
Rolled, oval, straight	19½
Curved	20½
Brass, 80-20, frt. allowed	
Cast, oval, 15 in. or longer	23½
Zinc, cast, 99.99, 15 in. or longer	16¼
Nickel, 99 per cent plus, frt. allowed	
Cast	47
Rolled, depolarized	48
Silver, 999 fine	
Rolled, 1-9 troy oz., per oz.	58*

Chemicals

(Cents per lb., f.o.b. shipping point)

Copper cyanide, 1-5 bbls.	34.00
Copper sulphate, 99.5, crystals, bbls.	7.75
Nickel salts, single, 425 lb. bbls., frt. allowed	13.50
Silver cyanide, 100 oz. lots	—.4179
Sodium cyanide, 96 per cent, domestic, 100 lb. drums	15.00
Zinc cyanide, 100 lb. drums	33.00
Zinc sulphate, 89 per cent, crystals, bbls., frt. allowed	6.35

*Price based on use of foreign silver.

SCRAP

. . . News and Market Activities

Blast Furnace Grades Down Slightly

New York

• • • It is evident that all factors in the scrap market have been holding back on transactions during the past week in order to gage the future developments in price and supply. Apparently new commitments have not been made necessary, with mill inventories sufficient to tide over producers at current low ingot production rates. There was definite evidence of weakness in blast furnace grades, however, in a number of districts, which in Detroit, New York and San Francisco resulted in small price recessions.

While the actual price reduction in these scrap grades is very small, if coupled with the low ingot rate, the end of the war and the wait-and-see attitude of consumers, it might well indicate the approach of a declining market similar to the one starting last September. Factors which would tend to resist such downward movement of the market are continued small mill inventories of scrap and a train of scrap supply which is inadequate to handle a steel volume approaching the maximum. Moreover, it is generally conceded that within the space of three to four months the reconversion boom may be getting into stride, and if mills at that time are unable to provide scrap for a large consumer demand, they may lose out in receiving the proper share of reconversion business.

Scrapyard labor is still not improving in volume and the industry has apparently not yet benefited from the lay-offs in war production fields. This is believed to be due to the fact that few employees of war plants are willing to go to work at the lower wages available in the scrap industry and many are eager to have a short vacation after their intensive war production efforts.

•

PITTSBURGH—The scrap market has shown no particular change during the past week. New demand is absent entirely from the market with the exception of a small lot of short shoveling turnings that sold at ceiling plus only a fractional springboard and commission. The break last week in machine shop turnings prices and the softening, even though slight, in short shoveling, may foretell a general weakening of prices in all grades of scrap. Now, however, any prediction of the market is pure guesswork and risky because no mills are buying and there is the chance that government surplus scrap may move into the market in large quantities. Observers' estimates on how soon this scrap will come into the market vary from two weeks to six months, and, to a great degree, it is this scrap that will be the determining factor on prices. Small lots of heavy scrap, according to some buyers, can be purchased here now at fractional or no springboards, but any large purchase would be at full ceiling with all extras.

•

CHICAGO—Purchase by a major consumer of a substantial tonnage of heavy melting steel and No. 1 bundles at ceiling confirmed prices for those items last week. Lack of transactions in blast furnace grades and machine shop turnings prevents accurate appraisal of apparent weakness. Drying up of turnings sources is apparent.

•

PHILADELPHIA — There are no indications here as yet of any weakness in prepared scrap. There has been some buying by three local mills at ceiling price. Consumers are asking for faster shipments.

•

DETROIT — Open hearth scrap continued to sell at ceiling today but blast furnace grades dropped slightly below, showing a 57c spread in all these grades.

•

BUFFALO—The scrap market coasted along this week at ceiling levels. Refreshed by orders for more than 20,000 tons of openhearth grades placed by the chief consumer since the V-J flurry. The total included overdue contracts for more than 6,000 tons, which were renewed following earlier cancellation. In addition to these commitments with local dealers, remote scrap continued to pour in from the East and West, with 10,000 tons by Lake giving stockpiles a healthy boost. Specialties were inclined to drag, but no price concessions were in evidence.

•

BOSTON—Although brokers and yards say the price situation is still more or less confusing, an eastern Pennsylvania mill has purchased heavy melting steel at ceiling prices, and foundries are taking all the cast they can get at ceiling prices. Prices paid for Boston navy yard scrap were equivalent to ceiling prices. Purchased tonnages so far have been comparatively small, however, which may account for the attitude of brokers and yards.

•

NEW YORK—Openhearth grades continued strong in this district this week with turnings dropping a little from the ceiling price. However, there is little or no new business on which to base a market analysis, shipments in most part representing tonnage covered by old orders. Machine shop turnings are quoted at $9.75 to $10.33. Scrap movement continues very slow and there is no evidence of relief as yet for the yard labor problem.

•

ST. LOUIS—Shipments of scrap iron continue to slow down, there being no easing of the tight labor shortage to gather and process the material. Cutbacks have caused decreasing supplies of industrial scrap. Mills are out of the market, but are not canceling any outstanding orders. Prices are unchanged.

•

CINCINNATI — District sources indicate that the scrap market is marking time for the next few weeks awaiting developments. They are able to dispose of all good clean stock, and are able to get tonnage on cancellations to make up for tonnage no longer available from war plants that have stopped production. Prices hold to the same level.

•

BIRMINGHAM — The scrap market here shows no immediate signs of returning to normal activity. Buyers generally are marking time and no new orders are being placed. No prices are being quoted and the only movement of material is on incompleted contracts.

•

CLEVELAND—Contrary to a crop of rumors, the ceiling market here is very steady. Mill inventories, although not too good for this time of year, are passable. There is not much scrap available, and turnings are noticeably tight. The opening of railroad lists has everybody grabbing. Yard labor is still scarce, even though shipments do not accurately reflect this tightness. The failure of reconversion scrap to put in an appearance has tended to keep scrap on the market at ceiling.

Dreifus Adds Laboratory

Philadelphia

• • • The Charles Dreifus Co. announces completion of a chemical laboratory at its turnings crusher plant at Briquette, Pa. All machine shop turnings shipped to this plant for crushing will be analyzed for chemical content. The laboratory will also serve shippers in analyzing other grades of scrap.

Buys Passenger Cars

Rio de Janeiro

• • • The Central Railway (Estrada de Ferro Central do Brasil) has just signed a contract with the representatives of Metropolitan Vickers, London, for the delivery of 30 first-class and 60 second-class passenger cars at a price of approximately one million pounds sterling.

Going prices as obtained in the trade by IRON AGE editors, based on representative tonnages. Where asterisks are used on quotations below, this indicates a ceiling price to which must be added brokerage fee and adjusted freight.

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. melting	$20.00*
RR. hvy. melting	21.00*
No. 2 hvy. melting	20.00*
RR. scrap rails	21.50*
Rails 3 ft. and under	23.50*
No. 1 comp'd sheets	20.00*
Hand bdld. new shts.	20.00*
Hvy. axle turn.	19.50*
Hvy. steel forge turn.	19.50*
Mach. shop turn.	14.00 to 15.00
Short shov. turn.	17.00*
Mixed bor. and turn.	15.00*
Cast iron borings	16.00*
Hvy. break cast.	16.50*
No. 1 cupola	20.00*
RR. knuck. and coup.	24.50*
RR. coil springs	24.50*
Rail leaf springs	24.50*
Rolled steel wheels	24.50*
Low phos. bil. crops	25.00*
Low phos.	22.50*
RR. malleable	22.00*

CHICAGO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.75*
No. 2 hvy. melting	18.75*
No. 1 bundles	18.75*
No. 2 dealers' bndls.	18.75*
Bundled mach. shop turn.	18.75*
Galv. bundles	16.75*
Mach. shop turn.	13.75*
Short shovel. turn.	15.75*
Cast iron borings	14.75*
Mix. borings & turn.	13.75*
Low phos. hvy. forge	23.75*
Low phos. plates	21.25*
No. 1 RR. hvy. melt.	19.75*
Reroll rails	22.25*
Miscellaneous rails	20.25*
Rails 3 ft. and under	22.25*
Locomotive tires, cut	22.75 to 23.25
Cut bolsters & side frames	20.25 to 21.25
Angles & splice bars	22.25*
Standard stl. car axles	25.00 to 25.50
No. 3 steel wheels	23.25*
Couplers & knuckles	23.25*
Agricul. malleable	22.00*
RR. malleable	22.00*
No. 1 mach. cast.	20.00*
No. 1 agricul. cast.	20.00*
Hvy. breakable cast.	16.50*
RR. grate bars	15.25*
Cast iron brake shoes	15.25*
Stove plate	19.00*
Clean auto cast.	20.00*
Cast iron carwheels	20.00*

CINCINNATI

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50*
No. 2 hvy. melting	19.50*
No. 1 bundles	19.50*
No. 2 bundles	19.50*
Mach. shop turn.	$10.50 to 11.00
Shoveling turn.	12.50 to 13.00
Cast iron borings	11.50 to 12.00
Mixed bor. & turn.	11.50 to 12.00
Low phos. plate	22.00*
No. 1 cupola cast.	20.00*
Hvy. breakable cast.	16.50*
Stove plate	19.00*
Scrap rails	21.00*

BOSTON

Dealers' buying prices per gross ton, f.o.b. cars

No. 1 hvy. melting	$15.05*
No. 2 hvy. melting	15.05*
No. 1 and 2 bundles	15.05*
Busheling	15.05*
Turnings, shovelings	12.05*
Machine shop turn.	10.05*
Mixed bor. & turn.	10.05*
Cl'n cast, chem. bor.	13.06 to 14.15*

Truck delivery to foundry

Machinery cast.	21.00 to 23.51*
Breakable cast	21.57 to 21.87*
Stove plate	20.00 to 23.51*

DETROIT

Per gross ton, brokers' buying prices:

No. 1 hvy. melting	$17.32*
No. 2 hvy. melting	17.32*
No. 1 bundles	17.32*
New busheling	17.32*
Flashings	17.32*
Mach. shop turn.	$11.75 to 12.32
Short shov. turn.	13.50 to 14.32
Cast iron borings	12.75 to 13.32
Mixed bor. & turn.	11.75 to 12.32
Low phos. plate	19.32*
No. 1 cupola cast	20.00*
Charging box cast.	19.00*
Hvy. breakable cast.	16.50*
Stove plate	19.00*
Automotive cast	20.00*

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.75*
No. 2 hvy. melting	18.75*
No. 2 bundles	18.75*
Mach. shop turn.	13.75*
Shoveling turn.	15.75*
Cast iron borings	13.50 to 14.00
Mixed bor. & turn.	13.75*
No. 1 cupola cast	20.00*
Hvy. breakable cast	16.50*
Cast, charging box	19.00*
Hvy. axle forge turn.	18.25*
Low phos. plate	21.25*
Low phos. punchings	21.25*
Billet crops	21.25*
RR. steel wheels	23.25*
RR. coil springs	23.25*
RR. malleable	22.00*

ST. LOUIS

Per gross ton delivered to consumer:

Heavy melting	$17.50*
Bundled sheets	17.50*
Mach. shop turn.	11.25 to 11.75
Locomotive tires, uncut	18.00
Misc. std. sec. rails	19.00*
Rerolling rails	21.00*
Steel angle bars	21.00*
Rails 3 ft. and under	21.50*
RR. springs	22.00*
Steel car axles	23.50*
Stove plate	19.00*
Grate bars	15.25*
Brake shoes	15.25*
RR. malleable	22.00*
Cast iron carwheels	20.00*
No. 1 mach'ery cast	20.00*
Breakable cast	16.50*

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting	$17.00*
No. 2 hvy. melting	17.00*
No. 2 bundles	17.00*
No. 1 busheling	17.00*
Long turnings	$9.50 to 10.00
Cast iron borings	10.50 to 11.00
Bar crops and plate	19.50*
Structural and plate	19.50*
No. 1 cast	20.00*
Stove plate	17.00
Steel axles	18.00*
Scrap rails	18.50
Rerolling rails	20.50*
Angles & splice bars	20.50*
Rails 3 ft. & under	21.00*
Cast iron carwheels	16.50 to 17.00

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. melting	$20.00*
No. 2 hvy. melting	20.00*
Low phos. plate	22.50*
No. 1 busheling	20.00*
Hydraulic bundles	20.00*
Mach. shop. turn.	15.00*
Short shovel. turn.	17.00*
Cast iron borings	16.00*

NEW YORK

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$15.33*
No. 2 hvy. melting	15.33*
Comp. black bundles	15.33*
Comp. galv. bundles	13.33*
Mach. shop turn.	9.75 to 10.33
Mixed bor. & turn.	9.75 to 10.33
Shoveling turn.	12.33*
No. 1 cupola cast	20.00*
Hvy. breakable cast	16.50*
Charging box cast	19.00*
Stove plate	19.00*
Clean auto cast.	20.00*
Unstrip. motor blks.	17.50*
Cl'n chem. cast bor.	14.33*

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.25*
No. 1 bundles	19.25*
No. 2 bundles	19.25*
No. 2 hvy. melting	19.25*
Mach. shop turn.	14.25*
Shoveling turn.	16.25*
Cast iron borings	15.25*
Mixed bor. & turn.	14.25*
No. 1 cupola cast.	20.00*
Stove plate	19.00*
Low phos. plate	21.75*
Scrap rails	20.75*
Rails 3 ft. & under	22.75*
RR. steel wheels	23.75*
Cast iron car wheels	20.00*
RR. coil & leaf spgs.	23.75*
RR. knuckles & coup.	23.75*
RR. malleable	22.00*
No. 1 busheling	19.25*

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50*
No. 2 hvy. melting	19.50*
Compressed sheet stl.	19.50*
Drop forge flashings	19.00*
No. 2 bundles	19.50*
Mach. shop turn.	14.50*
Short shovel.	16.50*
No. 1 busheling	19.50*
Steel axle turn.	19.00*
Low phos. billet and bloom crops	24.50*
Cast iron borings	15.50*
Mixed bor. & turn.	14.50*
No. 2 busheling	17.00*
No. 1 machine cast	20.00*
Railroad cast	20.00*
Railroad grate bars	15.25*
Stove plate	19.00*
RR. hvy. melting	20.50*
Rails 3 ft. & under	23.00*
Rails 18 in. & under	24.25*
Rails for rerolling	23.00*
Railroad malleable	22.00*
Elec. furnace punch	22.00*

SAN FRANCISCO

Per gross ton delivered to consumer:

RR. hvy. melting	$16.00
No. 1 hvy. melting	16.00
No. 2 hvy. melting	15.00
No. 2 bales	$13.50 to 14.25
No. 3 bales	9.50 to 10.59
Mach. shop turn.	7.00
Elec. furn. 1 ft., und.	15.50 to 17.00
No. 1 cupola cast.	19.00 to 21.00

LOS ANGELES

Per gross ton delivered to consumer:

No. 1 hvy. melting	$14.50 to $15.50
No. 2 hvy. melting	13.50 to 14.50
No. 2 bales	12.50 to 13.50
No. 3 bales	9.00 to 10.00
Mach. shop turn.	4.50
No. 1 cupola cast.	19.00 to 21.00

SEATTLE

Per gross ton delivered to consumer:

RR. hvy. melting	$14.50
No. 1 hvy. melting	14.50*
No. 3 bundles	11.50
Elec. furn. 1 ft., und.	17.00
No. 1 cupola cast.	20.00*

Comparison of Prices . .

Advances over past week in **Heavy Type**; declines in *Italics*. Prices are f.o.b. major basing points. The various basing points for finished and semifinished steel are listed in the detailed price tables.

Flat-Rolled Steel: (cents per pound)	Sept. 4, 1945	Aug. 28, 1945	July 31, 1945	Sept. 5, 1944
Hot-rolled sheets	2.20	2.20	2.20	2.10
Cold-rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.70	3.70	3.70	3.50
Hot-rolled strip	2.10	2.10	2.10	2.10
Cold-rolled strip	2.80	2.80	2.80	2.80
Plates	2.25	2.25	2.25	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terneplate: (dollars per base box)				
Tinplate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tinplate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (cents per pound)				
Merchant bars	2.25	2.25	2.25	2.15
Cold-finished bars	2.75	2.75	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (cents per pound)				
Bright wire	2.75	2.75	2.75	2.60
Wire nails	2.90	2.90	2.90	2.55
Rails: (dollars per gross ton)				
Heavy rails	$43.00	$43.00	$43.00	$40.00
Light rails	45.00	45.00	45.00	40.00
Semifinished Steel: (dollars per gross ton)				
Rerolling billets	$36.00	$36.00	$36.00	$34.00
Sheet bars	36.00	36.00	36.00	34.00
Slabs, rerolling	36.00	36.00	36.00	34.00
Forging billets	42.00	42.00	42.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (cents per pound)				
Wire rods	2.15	2.15	2.15	2.00
Skelp	1.90	1.90	1.90	1.90

Pig Iron: (per gross ton)	Sept. 4, 1945	Aug. 28, 1945	July 31, 1945	Sept. 5, 1944
No. 2 foundry, Phila.	$26.84	$26.84	$26.84	$25.84
No. 2, Valley furnace	25.00	25.00	25.00	24.00
No. 2, Southern, Cin'ti	25.44	25.44	25.44	24.44
No. 2, Birmingham	21.38	21.38	21.38	20.38
No. 2 foundry, Chicago†	25.00	25.00	25.00	24.00
Basic, del'd eastern Pa.	26.34	26.34	26.34	25.34
Basic, Valley furnace	24.50	24.50	24.50	23.50
Malleable, Chicago†	25.00	25.00	25.00	24.00
Malleable, Valley	25.00	25.00	25.00	24.00
L. S. charcoal, Chicago	42.34	42.34	42.34	37.34
Ferromanganese‡	135.00	135.00	135.00	135.00

† The switching charge for delivery to foundries in the Chicago district is 60¢ per ton.
‡ For carlots at seaboard.

Scrap: (per gross ton)				
Heavy melt'g steel, P'gh	$20.00	$20.00	$20.00	$19.76
Heavy melt'g steel, Phila.	18.75	18.75	18.75	18.00
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.32	17.32	17.32	15.25
Low phos. plate, Youngs'n	22.50	22.50	22.50	20.50
No. 1 cast, Pittsburgh	20.00	20.00	20.00	20.00
No. 1 cast, Philadelphia	20.00	20.00	20.00	20.00
No. 1 cast, Chicago	20.00	20.00	20.00	20.00
Coke, Connellsville: (per net ton at oven)				
Furnace coke, prompt	$7.50	$7.50	$7.50	$7.00
Foundry coke, prompt	9.00	9.00	9.00	8.25
Nonferrous Metals: (cents per pound to large buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00
Tin, Straits, New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, virgin, del'd	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony, Laredo, Tex.	14.50	14.50	14.50	14.50

Composite Prices . .

Starting with the issue of Apr. 22, 1943, the weighted finished steel index was revised for the years 1941, 1942 and 1943. See explanation of the change on p. 90 of the Apr. 22, 1943 issue. Index revised to a quarterly basis as of Nov. 16, 1944; for details see p. 93 of that issue. The finished steel composite prices for the current quarter are an estimate based on finished steel shipments for the previous quarter. These figures will be revised when the actual data of shipments for this quarter are compiled.

	FINISHED STEEL	PIG IRON	SCRAP STEEL
Sept. 4, 1945	2.41571¢ a pound	$24.61 a gross ton	$19.17 a gross ton
One week ago	2.41571¢ a pound	$24.61 a gross ton	$19.17 a gross ton
One month ago	2.41571¢ a pound	$24.61 a gross ton	$19.17 a gross ton
One year ago	2.25513¢ a pound	$23.61 a gross ton	$18.84 a gross ton

	FINISHED STEEL HIGH	FINISHED STEEL LOW	PIG IRON HIGH	PIG IRON LOW	SCRAP STEEL HIGH	SCRAP STEEL LOW
1945	2.41571¢ May 29	2.21189¢ Jan. 2	$24.61 Feb. 20	$23.61 Jan. 2	$19.17	$19.17
1944	2.30837¢ Sept. 5	2.21189¢ Oct. 5	$23.61	$23.61	19.17	$15.67 Oct. 24
1943	2.25513¢	2.25513¢	23.61	23.61	19.17	$19.17
1942	2.26190¢	2.26190¢	23.61	23.61	19.17	$19.17
1941	2.43078¢	2.43078¢	$23.61 Mar. 20	$23.45 Jan. 2	$22.00 Jan. 7	$19.17 Apr. 10
1940	2.30467¢ Jan. 2	2.24107¢ Apr. 16	23.45 Dec. 23	22.61 Jan. 2	21.83 Dec. 30	16.04 Apr. 9
1939	2.35367¢ Jan. 3	2.26689¢ May 16	22.61 Sept. 19	20.61 Sept. 12	22.50 Oct. 3	14.08 May 16
1938	2.58414¢ Jan. 4	2.27207¢ Oct. 18	23.25 June 21	19.61 July 6	15.00 Nov. 22	11.00 June 7
1937	2.58414¢ Mar. 9	2.32263¢ Jan. 4	23.25 Mar. 9	20.25 Feb. 16	21.92 Mar. 30	12.67 June 8
1936	2.32263¢ Dec. 28	2.05200¢ Mar. 10	19.74 Nov. 24	18.73 Aug. 11	17.75 Dec. 21	12.67 June 9
1935	2.07642¢ Oct. 1	2.06492¢ Jan. 8	18.84 Nov. 5	17.83 May 14	13.42 Dec. 10	10.33 Apr. 29
1934	2.15367¢ Apr. 24	1.95757¢ Jan. 2	17.90 May 1	16.90 Jan. 27	13.00 Mar. 13	9.50 Sept. 25
1933	1.95578¢ Oct. 3	1.75836¢ May 2	16.90 Dec. 5	13.56 Jan. 3	12.25 Aug. 8	6.75 Jan. 3
1932	1.89196¢ July 5	1.83901¢ Mar. 1	14.81 Jan. 5	13.56 Dec. 6	8.50 Jan. 12	6.43 July 5
1931	1.99626¢ Jan. 13	1.86586¢ Dec. 29	15.90 Jan. 6	14.79 Dec. 15	11.33 Jan. 6	8.50 Dec. 29
1930	2.25488¢ Jan. 7	1.97319¢ Dec. 9	18.21 Jan. 7	15.90 Dec. 16	15.00 Feb. 18	11.25 Dec. 9
1929	2.31773¢ May 28	2.26498¢ Oct. 29	18.71 May 14	18.21 Dec. 17	17.58 Jan. 29	14.08 Dec. 3

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 pct of the United States output. Index recapitulated in Aug. 28, 1941 issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

. . . Prices of Finished Iron and Steel

Steel prices shown here are f.o.b. basing points, in cents per pound unless otherwise indicated. Extras apply. Delivered prices do not reflect 3 pct tax on freight. (1) Mill run sheet, 10¢ per 100 lb under base; primes, 25¢ above base. (2) Unassorted commercial coating. (3) Widths up to 12-in. inclusive. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25¢ per 100 lb to fabricators. (8) Also shafting. For quantities of 20,000 to 39,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (11) Boxed. (12) This base price for annealed, bright finish wires, commercial spring wire. (13) Produced to dimensional tolerances in AISI Manual Sect. 6. For price exceptions to finished and semi-finished steels turn several pages.

Basing Points	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	10 Pacific Ports, Cars	DELIVERED TO Detroit	New York	Philadelphia
SHEETS															
Hot-rolled	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.30¢	2.20¢		2.75¢	2.30¢	2.44¢	2.37¢
Cold-rolled [1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.29¢	3.37¢
Galvanized (24 gage)	3.70¢	3.70¢	3.70¢		3.70¢	3.70¢	3.70¢	3.70¢	3.80¢	3.70¢		4.35¢		3.94¢	3.87¢
Enameling (20 gage)	3.45¢	3.45¢	3.45¢	3.45¢			3.45¢		3.55¢	3.45¢		4.10¢	3.55¢	3 81¢	3.77¢
Long ternes [2]	3.80¢	3.80¢	3.80¢									4.55¢		4 16¢	4.12¢
STRIP															
Hot-rolled [3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢	2.46¢	
Cold-rolled [4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester=3.00¢)					2 90¢	3.16¢	
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢							2.56¢	
Commodity cold-rolled	2.95¢	3.05¢		3.95¢			2.9⁵¢	(Worcester=3.35¢)					3.05¢	3.31¢	
TINPLATE															
Standard cokes, base box	$5.00	$5.00	$5.00						$5.10					5.36¢	5.32¢
Electro, box 0.25 lb	$4.35	$4.35	$4.35												
Electro, box 0.50 lb	$4.50	$4.50	$4.50						$4.60						
Electro, box 0.75 lb	$4.65		$4.65						$4.75						
BLACKPLATE															
29 gage [5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢[11]			3.37¢
TERNES, MFG.															
Special coated, base box	$4.30	$4.30	$4.30						$4.40						
BARS															
Carbon steel	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢		(Duluth=2.35¢)			2.60¢	2.90¢	2.35¢	2.59¢	2.57¢
Rail steel [6]	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢					2.60¢	2.90¢			
Reinforcing (billet) [7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢	2.25¢	2.39¢	
Reinforcing (rail) [7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢	2.55¢	2.25¢		2.47¢
Cold-finished [8]	2.75¢	2.75¢	2.75¢	2.75¢		2.75¢		(Detroit=2.80¢)			(Toledo=2.90¢)			3 09¢	3 07¢
Alloy, hot-rolled	2.70¢	2.70¢				2.70¢		(Bethlehem, Massillon, Canton=2.70¢)					2.80¢		
Alloy, cold-drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3 45¢		
PLATES								(Coatesville and Claymont=2.25¢)							
Carbon steel [13]	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢		2.25¢	2.25¢			2.60¢	2.80¢	2.47¢	2.44¢	2.30¢
Floor plates	3.50¢	3.50¢									3.85¢	4.15¢		3.96¢	3.83¢
Alloy	3.50¢	3.50¢			(Coatesville=3.50¢)						3.95¢	4.15¢		3 70¢	3.59¢
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem=2.10¢)			2.45¢	2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R															
0.26 to 0.50 carbon	3.80¢			3.80¢			(Worcester=3.00¢)								
0.51 to 0.75 carbon	4.30¢			4.30¢			(Worcester=4.50¢)								
0.76 to 1.00 carbon	6.15¢			6.15¢			(Worcester=6.35¢)								
1.01 to 1.35 carbon	8.35¢			8.35¢			(Worcester=8.55¢)								
WIRE [9]															
Bright [12]	2.75¢	2.75¢		2.75¢	2.75¢		(Worcester=2.85¢)			(Duluth=2.80¢)		3.25¢			3.07¢
Galvanized	Add proper size extra and galvanizing extra to Bright Wire base														
Spring (high carbon)	3.35¢	3.35¢		3.25¢			(Worcester=3.45¢)					3.85¢			3.67¢
PILING															
Steel sheet	2.40¢	2.40¢				2.40¢						2.95¢			2.72¢

SEMIFINISHED STEEL

Ingots, Carbon, Rerolling

Base per gross ton, f.o.b. mill.... $31.00

Ingots, Carbon, Forging

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown $36.00

Ingots, Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Coatesville, Chicago, Massillon, Pittsburgh $45.00

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.00 higher; delivered E. Michigan, $3.00 higher; f.o.b. Duluth, billets only, $2.00 higher; billets f.o.b. Pacific ports are $12.00 higher. Provo, $11.20 higher. Delivered prices do not reflect 3 pct tax on freight rates.

	Per Gross Ton
Rerolling	$36.00
Forging	42.00

Alloy Billets, Blooms, Slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo or Bethlehem, per gross ton $54.00

Price delivered Detroit $2.00 higher; East Michigan, $3.00 higher.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point.

	Per Gross Ton
Openhearth or bessemer	$36.00

SEMISILICA BRICKS

DURATION OF HEAT AFFECTS REFRACTORIES

Following statements are based on temperature range from 2200° F to 2700° F.

SHORT DURATIONS OF HEAT

Furnaces with daily or shorter firing cycles usually require a good clay or super duty brick.

MODERATE DURATIONS OF HEAT

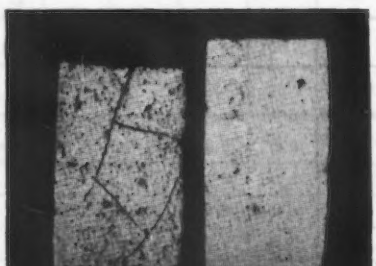
Furnaces with firing cycles of days, weeks or months require refractories which will not vitrify, shrink or spall, from the prolonged heats.

RM SEMISILICA BRICKS are made for this service. The picture at the right shows the results of 24 hours at 2650° F. on a First Quality Clay Brick and the almost unaffected RM.

LONG DURATIONS OF HEAT

Furnaces, intended to be run continuously can safely be lined with RM SEMISILICA BRICKS, provided the face temperature of the lining is below 2700° F. While silica bricks are ideal for continuous heats, a furnace may have to be shut down, which is hard on Silica Bricks, but RM SEMISILICA BRICKS take it easily.

Note. Some slags and gases attack refractories, so if in doubt, please ask or write for recommendation for your furnaces.



Compression, vitrification and spalling of First Quality Clay Brick, and relatively unaffected RM Semisilica brick after a run of 24 hours under heat and load.

In STEEL MILLS:

For Heating, Reheating, Annealing and Heat Treating Furnaces, OH Regenerators, Blast Furnace Stoves, Soaking Pits, etc. In the roofs, where spalling failure is most prevalent, they perform their greatest service.

In MANY INDUSTRIES:

Such as Chemical, Ceramic, Zinc Smelting and other industries where continuous heats in the temperature range of RM's are required for their processes.

RICHARD C. REMMEY SON CO.

PHILADELPHIA 37, PA.

REMMEY

PRICES

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.15c.
Worcester, Mass.	2.25c.
Birmingham	2.15c.
San Francisco	2.65c.
Galveston	2.40c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

Shell Steel

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.

Prices delivered Detroit are $2.00 higher; East Michigan, $3 higher.

Price Exceptions: Follansbee Steel Corp. permitted to sell at $13.00 per gross ton, f.o.b. Toronto, Ohio, above base price of $52.00.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

RAILS, TRACK SUPPLIES

(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton	$43.00
Angle splice bars, 100 lb.	2.70
(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	$45.00
Light rails (from rail steel)	44.00
	Base per Lb.
Cut spikes	3.25c.
Screw spikes	5.40c.
Tie plate, steel	2.30c.
Tie plates, Pacific Coast	2.45c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25c.

TOOL STEEL

(F.o.b. Pittsburgh, Bethlehem, Syracuse)

	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 3c. higher.

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	*Pacific Coast Basing Points†*
	Base per Keg	
Standard wire nails	$2.90	$3.40
Coated nails	2.90	3.40
Cut nails, carloads	3.85	....
	Base per 100 Lb.	
Annealed fence wire	$3.05	$3.55
Annealed galv. fence wire	3.40	3.90
	Base Column	
Woven wire fence*	67	85
Fence posts, carloads	69	86
Single loop bale ties	66	91
Galvanized barbed wire**	72	82
Twisted barbless wire	72	....

*15½ gage and heavier. **On 80-rod spools in carload quantities.

†Prices subject to switching or transportation charges.

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendment to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 8617-20	Hot Rolled, NE 9442-45 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-45 Ann.
**Philadelphia	$3.518	$4.872[5]	$4.788[a]	$3.922	$4.772	$3.606	$3.666	$3.822	$4.172	$5.816	$6.966	$7.072	$8.172
New York	3.59	4.612[2]	5.110	3.974[6]	4.772	3.758	3.758	3.853	4.203	5.858	6.908	7.103	8.203
Boston	3.744	4.744[9]	5.224[9]	4.106	4.715	3.912	3.912	4.044	4.244	6.012	7.062	7.194	8.394
Baltimore	3.394	4.852	4.894	3.902	4.782	3.594	3.759	3.802	4.152	....	....	....	....
Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.265	....	....	....	....
Chicago	3.25	4.20	5.231	3.60	4.65[17]	3.55	3.55	3.50	3.85	5.60	6.65	6.65	7.90
Milwaukee	3.387	4.337[3]	5.272[4]	3.737	4.787[17]	3.687	3.687	3.637	3.987	5.837	6.887	6.887	7.987
Cleveland	3.35	4.40	4.877[4]	3.60	4.45	3.40	3.558	3.35	3.85	5.606	6.656	6.65	7.75
Buffalo	3.35	4.40	4.754	3.819	4.669	3.63	3.40	3.35	3.85	5.60	6.65	6.65	7.75
Detroit	3.45	4.50	5.004	3.70	4.859[17]	3.609	3.661	3.45	3.90	5.93	6.98	6.959	8.059
Cincinnati	3.425	4.475[3]	4.925[5]	3.675	4.711	3.661	3.691	3.611	4.111	5.95	7.00	7.011	8.261
St. Louis	3.397	4.347[3]	5.172[4]	3.747	4.93[17]	3.697	3.697	3.647	4.131	5.961	7.031	7.031	8.131
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.85	5.60	6.65	6.65	7.90
St. Paul	3.50	4.46	5.257[4]	3.86	5.162[17]	3.812[3]	3.812[3]	3.762[3]	3.461	5.94	6.99	7.381	8.481
Omaha	3.865	5.443	5.608[4]	4.215	....	4.165	4.165	4.115	4.543	....	....	....	....
Indianapolis	3.518	4.568	4.548	3.768	4.741	3.63	3.63	3.58	4.00	5.93	6.98	6.98	8.23
Birmingham	3.45	....	4.75	3.70	....	3.55	3.55	3.50	4.33	....	....	....	....
Memphis	3.965[7]	4.66	5.265	4.215	....	4.065	4.065	4.015	4.33	....	....	....	....
New Orleans	4.058*	5.079	5.358	4.308	....	4.158	4.158*	4.108*	4.729	....	....	....	....
Houston	3.763	5.573	6.313[1]	4.313	....	4.25	4.25	3.75	6.473[3]	7.223	8.323	8.323	9.373
Los Angeles	5.00	7.20[3]	6.10[4]	4.95	5.813[15]	4.95	4.65	4.40	5.683	8.204	9.404	9.304	10.454
San Francisco	4.55[14]	7.304	6.354	4.50[14]	7.333[17]	4.65[14]	4.35[14]	4.15[14]	5.433	8.304	9.404	9.404	10.454
Seattle	4.65[12]	7.054	5.954	4.25[12]	....	4.75[12]	4.45[12]	4.35[12]	5.883	....	9.404	....	....
Portland	4.65[11]	6.604	5.754	4.75[11]	....	4.85[11]	4.45[11]	4.45[11]	5.633	8.304	9.404	8.304	9.404
Salt Lake City	4.53[017]	....	6.17[13]	5.53[17]	....	4.98[17]	4.98[17]	4.88[17]	6.00	....	....	....	....

National Emergency Steels

MILL EXTRAS

Designation	Basic Open-Hearth		Electric Furnace		Designation	Basic Open-Hearth		Electric Furnace	
	Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs		Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs
NE 8612	0.65¢	$13.00	$1.15	$23.00	NE 9427	0.75¢	$15.00	$1.25	$25.00
NE 8615	0.65	13.00	1.15	23.00	NE 9430	0.75	15.00	1.25	25.00
NE 8617	0.65	13.00	1.15	23.00	NE 9432	0.75	15.00	1.25	25.00
NE 8620	0.65	13.00	1.15	23.00	NE 9435	0.75	15.00	1.25	25.00
NE 8622	0.65	13.00	1.15	23.00	NE 9437	0.75	15.00	1.25	25.00
NE 8625	0.65	13.00	1.15	23.00	NE 9440	0.75	15.00	1.25	25.00
NE 8627	0.65	13.00	1.15	23.00	NE 9442	0.80	16.00	1.30	26.00
NE 8630	0.65	13.00	1.15	23.00	NE 9445	0.80	16.00	1.30	26.00
NE 8632	0.65	13.00	1.15	23.00	NE 9447	0.80	16.00	1.30	26.00
NE 8635	0.65	13.00	1.15	23.00	NE 9450	0.80	16.00	1.30	26.00
NE 8637	0.65	13.00	1.15	23.00					
NE 8640	0.65	13.00	1.15	23.00					
NE 8642	0.65	13.00	1.15	23.00	NE 9722	0.65	13.00	1.15	23.00
NE 8645	0.65	13.00	1.15	23.00	NE 9727	0.65	13.00	1.15	23.00
NE 8647	0.65	13.00	1.15	23.00	NE 9732	0.65	13.00	1.15	23.00
NE 8650	0.65	13.00	1.15	23.00	NE 9737	0.65	13.00	1.15	23.00
					NE 9742	0.65	13.00	1.15	23.00
					NE 9745	0.65	13.00	1.15	23.00
NE 8712	0.70	14.00	1.20	24.00	NE 9747	0.65	13.00	1.15	23.00
NE 8715	0.70	14.00	1.20	24.00	NE 9750	0.65	13.00	1.15	23.00
NE 8717	0.70	14.00	1.20	24.00	NE 9763	0.65	13.00	1.15	23.00
NE 8720	0.70	14.00	1.20	24.00	NE 9768	0.65	13.00	1.15	23.00
NE 8722	0.70	14.00	1.20	24.00					
NE 8725	0.70	14.00	1.20	24.00					
NE 8727	0.70	14.00	1.20	24.00	NE 9830	1.30	28.00	1.80	36.00
NE 8730	0.70	14.00	1.20	24.00	NE 9832	1.30	28.00	1.80	36.00
NE 8732	0.70	14.00	1.20	24.00	NE 9836	1.30	28.00	1.80	36.00
NE 8735	0.70	14.00	1.20	24.00	NE 9837	1.30	28.00	1.80	36.00
NE 8737	0.70	14.00	1.20	24.00	NE 9840	1.30	28.00	1.80	36.00
NE 8740	0.70	14.00	1.20	24.00	NE 9842	1.30	28.00	1.80	36.00
NE 8742	0.70	14.00	1.20	24.00	NE 9845	1.30	28.00	1.80	36.00
NE 8745	0.70	14.00	1.20	24.00	NE 9847	1.30	28.00	1.80	36.00
NE 8747	0.70	14.00	1.20	24.00	NE 9850	1.30	28.00	1.80	36.00
NE 8750	0.70	14.00	1.20	24.00					
					NE 9912	1.20	24.00	1.55	31.00
NE 9415	0.75	15.00	1.25	25.00	NE 9915	1.20	24.00	1.55	31.00
NE 9417	0.75	15.00	1.25	25.00	NE 9917	1.20	24.00	1.55	31.00
NE 9420	0.75	15.00	1.25	25.00	NE 9920	1.20	24.00	1.55	31.00
NE 9422	0.75	15.00	1.25	25.00	NE 9922	1.20	24.00	1.55	31.00
NE 9425	0.75	15.00	1.25	25.00	NE 9925	1.20	24.00	1.55	31.00

Note 1: The ranges shown are restricted to sizes 100 sq. in. or less or equivalent cross-sectional area 12 in. wide or under with a maximum individual piece weight of 7000 lb. irrespective of size. **Note 2:** For steels ordered to such ranges, below the size and weight restriction, the average of all the chemical checks must be within the limits specified subject to check analysis variations given in Table 4, Section 10, AISI Steel Products Manual. **Note 3:** When acid open-hearth is specified and acceptable, add to basic open-hearth alloy differential 0.25c. per lb. for bars and bar strip and $5 per gross ton for billets, blooms and slabs. **Note 4:** The extras shown are in addition to the base price of $2.70 for 100 lb. on finished products and $54 per gross ton on semi-finished steel, major basing points, and are in cents per pound when applicable to bars and bar-strip and in dollars per gross ton when applicable to billets, blooms and slabs. The full extra applicable over the base price is the total of all extras indicated by the specific requirements of the order. The higher extra shall be charged for any size falling between two published extras.

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1499 lb.; strip, extras on all quantities; bars, 1500 lb. base.

NE ALLOY BARS: 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 199 lb. (7) 400 to 1499 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 800 to 4999 lb. (12) 800 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb. and over. (15) 1000 lb. and over. (16) 1500 lb. and over. (17) 2000 lb. and over. (18) 3500 lb. and over.

(a) Philadelphia: Galvanized sheet, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

*Add 0.27¢. for sizes not rolled in Birmingham.

**City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

LAKE SUPERIOR ORES

(51.50% *Fe, Natural Content, Delivered Lower Lake Ports**)

	Per Gross Ton
Old range, bessemer, 51.50	$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorus, 51.50	4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF_2 Content:	*Base price per short ton*
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

Standardize
YOUR HANDLING PROBLEMS

with EUCLID CRANES

This photo was taken at one factory of a great industrial empire in whose various plants Euclid Cranes and Hoists are being used in constantly increasing numbers.

Knowing the high standards to which such equipment must measure up for its acceptance and the rigid demands made upon it as to performance, we gratefully regard this significant trend toward Euclid equipment as an implied endorsement of its great worth.

You, too, will find among Euclid Cranes and Hoists a unit that will measure up to your requirements and render for a long period of time the kind of relatively trouble-free service your own exacting standards demand.

★
WE CAN DELIVER A LIMITED NUMBER OF 5 to 10 TON CRANES in 60 to 90 Days

THE EUCLID CRANE & HOIST CO.
1361 CHARDON RD., EUCLID, OHIO

PRICES

WELDED PIPE AND TUBING

Base discounts, f.o.b. Pittsburgh district and Lorain, Ohio, mills
(F.o.b. Pittsburgh only on wrought pipe) base price—$200.00 per net ton

	Black	Galv.
Steel (buttweld)		
⅛-in.	63½	51
¼-in.	66½	55
⅜-in. to 3-in.	68½	57½
Wrought Iron (buttweld)		
⅛-in.	24	3½
¼-in.	30	10
⅜-in. and ½-in.	34	16
¾-in.	38	18½
1-in.	37½	18
Steel (lapweld)		
2-in.	61	49½
2½-in. and 3-in.	64	52½
3½-in. to 6-in.	66	54½
Wrought Iron (lapweld)		
2-in.	30½	13
2½-in. to 3½-in.	31½	14½
4-in.	33½	18
4½-in. to 8-in.	32½	17
Steel (butt, extra strong, plain ends)		
⅛-in.	61½	50½
¼-in.	65½	54½
⅜-in. to 3-in.	67	57
Wrought Iron (same as above)		
⅛-in.	25	6
¼-in.	31	12
⅜-in. to 2-in.	38	19½
Steel (lap, extra strong, plain ends)		
2-in.	59	48½
2½-in. and 3-in.	63	52½
3½-in. to 6-in.	66½	56
Wrought Iron (same as above)		
2-in.	33½	15½
2½-in. to 4-in.	39	22½
4½-in. to 6-in.	37½	21

On buttweld and lapweld steel pipe jobbers are granted a discount of 5 pct. On L.c.l. shipments prices are determined by adding 25 pct and 30 pct and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lapweld and one point lower discount, or $2 a ton higher on all buttweld.

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
6-in. and larger, Birmingham	46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles	69.40
6-in. and larger f.o.b. cars, Seattle	71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger are $45 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect 3 pct tax on freight rates.

BOILER TUBES

Seamless steel and lapweld commercial boiler tubes and locomotive tubes, Minimum wall. Net base prices per 100 ft f.o.b. Pittsburgh, in carload lots.

	Seamless Cold-Drawn	*Seamless Hot-Rolled*	*Lapweld, Hot-Rolled*
2 in. O.D. 13 B.W.G.	15.03	13.04	12.38
2½ in. O.D. 12 B.W.G.	20.21	17.54	16.58
3 in. O.D. 12 B.W.G.	22.48	19.50	18.35
3½ in. O.D. 11 B.W.G.	28.37	24.62	23.15
4 in. O.D. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb or ft and over	Base
30,000 lb or ft to 39,999 lb or ft	5 pct
20,000 lb or ft to 29,999 lb or ft	10 pct
10,000 lb or ft to 19,999 lb or ft	20 pct
5,000 lb or ft to 9,999 lb or ft	30 pct
2,000 lb or ft or 4,999 lb or ft	45 pct
Under 2,000 lb or ft	65 pct

PRICES

CORROSION AND HEAT-RESISTING STEEL

(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	14.00c.	35.00c.
Cold strip	23.00c.	23.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

REFRACTORIES

(F.o.b. Works)

Fire Clay Brick

	Per 1000
Super-duty brick, St. Louis	$68.55
First quality, Pa., Md., Ky., Mo., Ill.	54.45
First quality, New Jersey	59.45
Sec. quality, Pa., Md. Ky., Mo., Ill.	49.40
Sec. quality, New Jersey	54.15
No. 1 Ohio	45.75
Ground fire clay, net ton	8.05

Silica Brick

Pennsylvania and Birmingham	$54.45
Chicago District	62.45
Silica cement, net ton (Eastern)	9.55

Chrome Brick

	Per Net Ton
Standard chemically bonded, Balt., Plymouth Meeting, Chester	$54.00

Magnesite Brick

Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00

Grain Magnesite

Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$43.45
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

EXCEPTIONS TO RPS 6

Ingots, carbon, rerolling—Phoenix Iron Co. may charge $38.75; Kaiser Co., $43.00 f.o.b. Pacific Coast ports; Empire Sheet & Tinplate Co., $34.25; Pgh. Steel Co., $33.10. Granite City Steel, $39.45.

Ingots, carbon, forging—Phoenix Iron Co. may charge $43.00; Empire Sheet & Tinplate Co., $39.25, f.o.b. Mansfield, Ohio; West Coast producers, $48.00, f.o.b. Pacific Coast Ports; Pgh. Steel Co., $38.10.

Ingots, alloy—C/1 delivered Detroit add $2.00; delivered East Michigan add $3.00. Connors Steel Co. may charge $45.00 f.o.b. Birmingham.

Slabs, per gross ton—Andrews Steel Co. $41 basing pts.; Wheeling Steel Corp. (rerolling) 4 in. sq. or larger $37.75 f.o.b. Portsmouth, Ohio; Empire Sheet & Tin Plate Corp. $41; Phoenix Iron Co. (rerolling) $41, (forging) $47; Granite City Steel $47.50; Kaiser Co., (rerolling) $58.64, (forging) $64.64, f.o.b. Los Angeles.

Blooms, per gross ton—Phoenix Iron Co. (rerolling) $41; (forging) $47; Pgh. Steel Co. (rerolling) $38.25, (forging) $44.25; Wheeling Steel Corp. (rerolling) 4 in. sq. or larger $37.75 f.o.b. Portsmouth; Kaiser Co. (rerolling) $58.64, (forging) $64.64 (shell steel) $74.64 f.o.b. Los Angeles.

Sheet Bar, per gross ton—Empire Sheet & Tinplate Co. $39 mill; Wheeling Steel Corp. $38 Portsmouth, Ohio.

Billets, Forging, per gross ton—Andrews Steel Co. $50 basing pts.; Follansbee Steel Corp. $49.50 Toronto, Ohio; Phoenix Iron Co. $47 mill; Geneva Steel Co. $64.64 f.o.b. Pacific Coast; Pittsburgh Steel Co. $49.50; Kaiser Co. $64.64, (shell steel) $74.64, f.o.b. Los Angeles.

HEAT TREATED STEEL SHOT

We manufacture shot and grit for endurance

A shot or grit that will blast fast with a clean finish.

This is the only reason why so many operators are daily changing to our shot and grit, from Maine to California.

The unprecedented demand for our—

Heat-Treated Steel Shot and Heat-Treated Steel Grit

has enabled us to expand our production and maintain a quality that is more than satisfactory to our hundreds of customers all over the country.

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Manchester, New Hampshire

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Well done..

A grateful tribute to our country's fighting men and women . . . everywhere . . . from the entire B-G-R organization.

Now let us bend every effort towards getting back to normal quickly and let us all keep on striving to make this a truly better world to live in.

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Write with Paint MARKAL on all HOT and COLD Surfaces

Inspection and Identification Marking on Armor Plates

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Generally available through Jessop Warehouses are the following:

High Speed Tool Steels: Water Air and Oil Hardening Tool and Die Steels; Chisel and Shock Resisting Tool Steels; T and V Cast Alloy Tool Holder Bits; Malta Carbide Tipped Tools; Bars, Sheets, Plates; Cast-to-Shape Ring Dies; Aircraft Sheets; Precision Gauge Stock; Drill Rod; Stainless Bar, Rod, Sheets, etc.

Literature on any of these steels available by addressing the Jessop Home Office.

WAREHOUSES

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- CLEVELAND, OHIO 1433 Hamilton Avenue
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- DETROIT, MICHIGAN Woodbridge & Walker Sts.
- MONTREAL, CANADA 1121 Notre Dame St. West
- TORONTO, CANADA 530 Front Street, West

Sales Offices in Principal Cities

JESSOP STEEL CO.

Head Office and Works: Washington, Pa. Established 1901

PRICES

Billets, Rerolling, per gross ton—Continental Steel Corp. may charge Acme Steel in Chicago switching area $34 plus freight from Kokomo, Ind.; Northwestern Steel & Wire Co. (Lend-Lease) $41 mill; Wheeling Steel Corp. 4 in. sq. or larger $37.75, smaller $39.50 f.o.b. Portsmouth, Ohio; Stanley Works may sell Washburn Wire Co. under allocation at $39 Bridgeport, Conn.; Keystone Steel & Wire Co. may sell Acme Steel Co. at $39 base, f.o.b. Peoria; Phoenix Iron Co. $41 mill; Continental Steel Corp. (1¾ x 1¾) $39.50, (2 x 2) $40.60 Kokomo, Ind. (these prices include $1 size extra); Keystone Steel & Wire Co. $36.40 Peoria; Connors Steel Co. $50.60 Birmingham; Ford Motor Co. $34 Dearborn, Mich.; Geneva Steel Co. $58.64 f.o.b. Pacific Coast; Pgh. Steel Co. $43.50; Kaiser Co $58.64 f.o.b. Los Angeles.

Structural Shapes—Phoenix Iron Co. 2.35c. basing pts. (export) 2.50c. Phoenixville; Knoxville Iron Co. 2.30c. basing points; Kaiser Co. 3.20c. f.o.b. Los Angeles.

Rails, per gross ton—Sweet Steel Co. (rail steel) $50 mill; West Virginia Rail Co. (lightweight) on allocation based Huntington, W. Va.; Colorado Fuel & Iron, $45 Pueblo.

Hot Rolled Plate—Granite City Steel Co. 2.85c. produced on DPC eqpt., 2.35c. otherwise; Knoxville Iron Co. 2.25c. basing pts.; Kaiser Co. and Geneva Steel Co. 3.20c. Pacific Ports; Central Iron and Steel Co. 2.50c. basing points; Granite City Steel Co. 2.35c. Granite City.

Merchant Bars—W. Ames Co., 10 tons and over, 2.85c. mill; Eckels-Nye Steel Corp. 2.50c. basing pts. (rail steel) 2.40c.; Phoenix Iron Co. 2.40c. basing pts.; Sweet Steel Co. (rail steel) 2.35c. mill; Joslyn Mfg. & Supply Co., 2.35c. Chicago; Calumet Steel Div., Borg Warner Corp. (8 in. mill bar), 2.35c. Chicago; Knoxville Iron Co., 2.30c. basing pts.; Laclede Steel Co., sales to LaSalle Steel granted Chicago base, f.ob Madison, Ill.; Milton Mfg. Co., 2.75c. f.o.b. Milton, Pa.

Pipe Skelp—Wheeling Steel, Benwood, 2.05c.

Reinforcing Bars—W. Ames & Co., 10 tons and over, 2.85c. mill; Sweet Steel Co. (rail steel), 2.35c. mill; Columbia Steel Co., 2.50c. Pacific Ports.

Cold Finished Bars—Keystone Drawn Steel Co. on allocation, Pittsburgh c.f. base plus c/l freight on hot rolled bars Pittsburgh to Spring City, Pa.; New England Drawn Steel Co. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to Mansfield, Mass., f.o.b. Mansfield; Empire Finished Steel Corp. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to plants, f.o.b. plant; Compressed Steel Shafting Co. on allocation outside New England, Buffalo base plus c/l freight Buffalo to Readville, Mass., f.o.b. Readville; Medart Co. in certain areas, Chicago c.f. base plus c/l freight Chicago to St. Louis, f.o.b. St. Louis.

Alloy Bars—Texas Steel Co., for delivery except Texas and Okla., Chicago base, f.o.b. Fort Worth, Tex.; Connors Steel Co., shipped outside Ala., Mississippi, Louisiana, Georgia, Florida, Tenn., Pittsburgh base, f.o.b. Birmingham.

Hot Rolled Strip—Joslyn Mfg. & Supply Co., 2.30c. Chicago; Knoxville Iron Co., 2.25c. basing pts.

Hot Rolled Sheets—Andrews Steel Co., Middletown base on shipments to Detroit or area; Parkersburg Iron & Steel, 2.25c. Parkersburg-Granite City Steel 2.45c.

Galvanized Sheets—Andrews Steel Co. 3.75c. basing pts.; Parkersburg Iron & Steel Co., 3.85c. Parkersburg; Continental Steel Co., Middletown base on Kokomo, Ind., product; Superior Sheet Steel Co., Pittsburgh base except for Lend-Lease.

Pipe and Tubing—South Chester Tube Co. when priced at Pittsburgh, freight to Gulf Coast and Pacific Ports may be charged from Chester, Pa., also to points lying west of Harrisburg, Pa.

Black Sheets—Empire Sheet and Tinplate Co., maximum base price mill is 2.45c. per 100 lb., with differentials, transportation charges, etc., provided in RPS. No. 6.

Wire Products—Pittsburgh Steel Co., f.o.b. Pittsburgh, per 100 lb., rods, No. 5 to 9/32 in., 2.20c.; rods, heavier than 9/32, 2.35c.; bright wire, 2.725c.; bright nails, 2.90c.; lead and furnace annealed wire, 2.85c.; pot annealed wire, 2.85c.; galvanized barbed wire, 3.90c.; plain staples, 2.55c.; galvanized staples, 2.65c.; bright spring wire, 3.30c.; galvanized spring wire, 3.45c.

BASING POINT* BASE PRICES

Basing Point	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Bethlehem	$25.50	$26.00	$26.50	$27.00	.....
Birdsboro	25.50	26.00	26.50	27.00	$30.50
Birmingham	20.00	21.38	.....	26.00	.....
Buffalo	24.00	25.00	25.50	26.00	30.50
Chicago	24.50	25.00	25.00	25.50	.....
Cleveland	24.50	25.00	25.00	25.50	.....
Detroit	24.50	25.00	25.00	25.50	.....
Duluth	25.00	25.50	25.50	26.00	.....
Erie	24.50	25.00	25.50	26.00	.....
Everett	25.50	26.00	26.50	27.00	.....
Granite City	24.50	25.00	25.00	25.50	.....
Hamilton	24.50	25.00	25.00	.....	.....
Neville Island	24.50	25.00	25.00	25.50	.....
Provo	22.50	23.00	.....	.....	.....
Sharpsville[1]	24.50	25.00	25.00	25.50	.....
Sparrows Point	25.50	26.00	.....	.....	.....
Steelton	25.50	.....	.....	.....	30.50
Swedeland	25.50	26.00	26.50	27.00	.....
Toledo	24.50	25.00	25.00	25.50	.....
Youngstown	24.50	25.00	25.00	25.50	.....

DELIVERED PRICES† (BASE GRADES)

Consuming Point	Basing Point	Freight Rate	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Boston	Everett	$ .50	$26.00	$26.50	$27.00	$27.50	.....
Boston	Birdsboro-Steelton	4.02	.....	.....	.....	.....	$34.52
Brooklyn	Bethlehem	2.50	28.00	28.50	29.00	29.50	.....
Brooklyn	Birdsboro	2.92	.....	.....	.....	.....	33.42
Canton	Cleveland	1.39	25.89	26.39	26.39	26.89	.....
Canton	Buffalo	3.19	.....	.....	.....	.....	33.69
Cincinnati	Birmingham	4.06	24.06	28.44	.....	.....	.....
Cincinnati	Hamilton	1.11	.....	.....	26.11	.....	.....
Cincinnati	Buffalo	4.40	.....	.....	.....	.....	34.90
Jersey City	Bethlehem	1.53	27.03	27.53	28.03	28.53	.....
Jersey City	Birdsboro	1.94	.....	.....	.....	.....	32.44
Los Angeles	Provo	4.95	27.45	27.95	.....	.....	.....
Los Angeles	Buffalo	15.41	.....	.....	.....	.....	46.91
Mansfield	Cleveland & Toledo	1.84	26.34	26.84	26.84	27.34	.....
Mansfield	Buffalo	3.36	.....	.....	.....	.....	33.86
Philadelphia	Swedeland	.84	26.34	26.84	27.34	27.84	.....
Philadelphia	Birdsboro	1.24	.....	.....	.....	.....	31.74
San Francisco	Provo	4.95	27.45	27.95	.....	.....	.....
San Francisco	Buffalo	15.41	.....	.....	.....	.....	46.91
Seattle	Provo	4.95	27.45	27.95	.....	.....	.....
Seattle	Buffalo	15.41	.....	.....	.....	.....	46.91
St. Louis	Granite City	.50	25.00	25.50	25.50	26.00	.....
St. Louis	Buffalo	7.07	.....	.....	.....	.....	37.57

* Maximum per gross ton, established by OPA February 14, 1945. † Prices do not reflect 3 per cent tax on freight.

(1) Struthers Iron & Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable.

Charcoal pig iron base prices for Lyles, Tenn., and Lake Superior furnaces, $33.00 and $34.00, respectively. Newberry Brand of Lake Superior charcoal iron $39.00 per g.t., f.o.b. furnace, by order L 39 to RPS 10, April 11, 1945, retroactive to March 7, 1945. Delivered to Chicago, $42.34. High phosphorus iron sells at Lyles, Tenn., at $28.50.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 to 2.25 per cent); Phosphorus differentials, a reduction of 38c. per ton for phosphorus content of 0.70 per cent and over; Manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and $1 per ton extra for each additional 0.25 per cent nickel.

Silvery iron and bessemer ferrosilicon up to and including 14.00 per cent silicon covered by RPS 10 as amended Feb. 14, 1945. Silvery iron, silicon 6.00 to 6.50 per cent, C/L per G.T., f.o.b. Jackon, Ohio—$30.50; f.o.b. Buffalo—$31.75. Add $1.00 per ton for each additional 0.50% Si. Add 50c. per ton for each 0.50% Mn over 1.00%. Add $1.00 per ton for 0.75% or more P. Bessemer ferrosilicon prices are $1.00 per ton above silvery iron prices of comparable analysis.

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, ¢ per lb, ton lots.

Copper, electrolytic, 150 and 200 mesh	21½¢ to 23½¢
Copper, reduced, 150 and 300 mesh	20½¢ to 25½¢
Iron, commercial, 100 and 200 mesh 96 + % Fe	12½¢ to 15¢
Iron, crushed, 200 mesh and finer, 90 + % Fe carload lots	4¢
Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe, drum lots	63¢
Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe	30 to 33¢
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe	43¢
Iron carbonyl, 300 mesh and finer, 98-99.8 + % Fe	90¢
Aluminum, 100 and 200 mesh	*25¢
Antimony, 100 mesh	30¢
Cadmium, 100 mesh	$1.40
Chromium, 100 mesh and finer	$1.25
Lead, 100, 200 & 300 mesh	11½ to 15¢
Manganese	85¢
Nickel, 150 mesh	51½¢
Solder powder, 100 mesh	31½¢ plus metal
Tin, 100 mesh	53¾¢
Tungsten metal powder, 98%-99%, any quantity, per lb	$2.60
Molybdenum powder, 99%, in 200-lb kegs, f.o.b. York, Pa., per lb	$2.60
Under 100 lb	$3.00

*Freight allowed east of Mississippi.

COKE

	Net Ton
Furnace, beehive (f.o.b. oven)	
Connellsville, Pa.	$7.50*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	9.00
Foundry, By-Product	
Chicago, del'd	13.75
Chicago, f.o.b.	13.00
New England, del'd	14.65
Kearny, N. J., f.o.b.	13.05
Philadelphia, del'd	13.25
Buffalo, del'd	12.40
Portsmouth, Ohio, f.o.b.	11.50
Painesville, Ohio, f.o.b.	12.15
Erie, del'd	13.15
Cleveland, del'd	13.30
Cincinnati, del'd	13.25
St. Louis, del'd	14.25
Birmingham, del'd	10.90

* Hand drawn ovens using trucked coal permitted to charge $8.00 per ton plus transportation charges.

Safe Welding
AT LOWER PRODUCTION COSTS

The Weldit Gasaver shuts off the welding flame when not in use. . . . Conserves essential materials by cutting oxygen and acetylene consumption as much as *fifty* per cent. Prevents injury to workmen—or sudden fires—from dangerous idle torch flames. . . . Adjustment remains unaltered between welds.

When the Weldit Gasaver has been installed, you simply hang idle torch on the handy lever rod. Weight of torch pulls rod down, thus automatically shutting off supply lines. Relight instantly by passing torch over Gasaver pilot light. No bother. . . . No time lost. . . . *No readjusting required.* . . . Price $10.00 at Detroit. Order today.

Better Soldering, Annealing and Heating Jobs

The Weldit Model CW Blowpipe is in daily use by many foremost industrial plants. . . . Built in accordance with the recommendations of leading fabricators of sheet metal products. . . . Operates on either natural gas, manufactured gas, or other low temperature fuel gas and compressed air. Stands up under rough shop use. . . . Send for literature.

WELDIT ACETYLENE CO.
641 BAGLEY AVENUE · DETROIT 26, MICH.

In Completing Contract Settlements Hinckley Urges Utmost Haste

Washington

• • • The main problem in contract settlement at present is to make sure that contractors with terminations file their claims promptly, according to Robert H. Hinckley, director of contract settlement.

Emphasizing that the government cannot settle claims until they are filed by contractors, Mr. Hinckley urged all contractors who received termination notices as a result of the victory over Japan to get their claims in promptly.

"Delay in filing claims may seriously impede the entire contract settlement program," he said. "Settlements in July have already been slowed up by failure of contractors to take prompt action on their V-E Day terminations.

"To avoid having industry's funds tied up during the critical reconversion period, provision for interim financing was made by regulations issued by this office. The latest surveys disclose that ample funds are available to finance contractors with terminations either through partial payments or guaranteed T-Loans. This is contrary to the statement issued by the National Association of Manufacturers that 'The operating funds of industry may be tied up for six months.' Under existing provisions there is no reason why contractors in most cases cannot get liberal partial payments or guaranteed T-Loans within 30 days after application.

"It is too early for the effects of the terminations following the victory over Japan to be reflected in settlements, but we cannot afford delay. It is important, therefore, that contractors not yet thoroughly familiar with contract settlement procedures and the methods of filing acceptable claims immediately communicate with their government contracting agency or the Termination Coordination Committee in their region."

PERFORATED METALS
ORNAMENTAL
Any Metal
Any Perforation
For INDUSTRIAL purposes a great variety of sizes and shapes of perforations are required, ranging from very fine to as large as 6" or more in diameter. We are equipped to supply all standard perforations in all kinds and thicknesses of metals.
ORNAMENTAL patterns are covered by our grille catalog. If interested, we hope you will send for it. There are attractive patterns for different uses.
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PRICES

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:

Base discount less case lots

	Per Cent Off List
½ in. & smaller x 6 in. & shorter	65½
9/16 & ⅝ in. x 6 in. & shorter	63½
¾ to 1 in. x 6 in. & shorter	61
1⅛ in. and larger, all lengths	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed

(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	U.S.S.	S.A.E.
Base discount less keg lots		
7/16 in. and smaller	..	64
½ in. and smaller	62	..
⅝ in. through 1 in.	..	60
9/16 in. through 1 in.	59	
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full keg lots, 10 per cent additional discount.

Stove Bolts	*Consumer*
Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets

(½ in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets

(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5

Cap and Set Screws	*Consumer Per Cent Off List*
Upset full fin, hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00

ELECTRICAL SHEETS

(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.30c.
Armature	3.65c.
Electrical	4.15c.
Motor	5.05c.
Dynamo	5.75c.
Transformer 72	6.25c.
Transformer 65	7.25c.
Transformer 58	7.75c.
Transformer 52	8.55c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

FERROALLOY PRICES

Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk)	$135.00
Carload lots (packed)	141.00
Less ton lots (packed)	148.50

$1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Manganese Metal

Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Spot sales add 2c. per lb.

96-98% Mn, .2% max. C, 1% max. Si, 2% max. Fe.

Carload, bulk	36c.
L.c.l. lots	38c.

95-97% Mn, .2% max. C, 1.5% max. Si, 2.5% max. Fe.

Carload, bulk	34c.
L.c.l. lots	35c.

Spiegeleisen

Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$35.00	$36.00
Less ton	47.50	48.50

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carloads, f.o.b. shipping point with freight allowed.

	Eastern Zone	Central Zone	Western Zone
50% Si	6.65c.	7.10c.	7.25c.
75% Si	8.05c.	8.20c.	8.75c.
80-90% Si.	8.90c.	9.05c.	9.55c.
90-95% Si.	11.05c.	11.20c.	11.65c.

Spot sales add: 45c. per lb. for 50% Si, .3c. per lb. for 75% Si, .25c. per lb. for 80-90% and 90-95% Si.

Silvery Iron

Silvery Iron, Silicon 14.01 to 14.50 per cent, $45.50 per G. T. f.o.b. Jackson, Ohio. Add $1.00 per ton for each additional 0.50% Si up to and including 18%. Add $1.00 per ton for low impurities, not to exceed: P—0.05%, S—0.04%, C—1.00%. Covered by MPR 405.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	3.35c.	3.50c.	3.65c.
2000 lb-carload	3.8c.	4.2c.	4.25c.

Silicomanganese

Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk	6.05c.
2000 lb. to carload	6.70c.
Under 2000 lb.	6.90c.
Briquets, contract, basis carlots, bulk freight allowed, per lb.	5.80c.
2000 lb. to carload	6.30c.
Less ton lots	6.55c.

Ferrochrome

(65-72% Cr. 2% max. Si)

OPA maximum base contract prices per lb. of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.

	Eastern Zone	Central Zone	Western Zone
0.06% C	23.00c.	23.40c.	24.00c.
0.10% C	22.50c.	22.90c.	23.50c.
0.15% C	22.00c.	22.40c.	23.00c.
0.20% C	21.50c.	21.90c.	22.50c.
0.50% C	21.00c.	21.40c.	22.00c.
1.00% C	20.50c.	20.90c.	21.50c.
2.00% C	19.50c.	19.90c.	21.00c.
66-71% Cr, 4-10%	13.00c.	13.40c.	14.00c.
62-66% Cr, 5-7% C	13.50c.	13.90c.	14.50c.

High-Nitrogen Ferrochrome

Low-carbon type: 67-72% Cr, 0.75% N. Add 2c. per lb. to regular low-carbon ferrochrome price schedule. Add 2c. for each additional 0.25% N. High-carbon type: 66-71% Cr, 4-5% C, 0.75% N. Add 5c. per lb. to regular high-carbon ferrochrome price schedule.

Low-Carbon Ferromanganese

Contract prices per lb. of manganese contained, lump size, f.o.b. shipping point, freight allowed to destination, Eastern Zone. Add 0.25c. for spot sales.

	Carloads, Ton Bulk	Less Ton Lots	Less Ton
0.10% max. C, 1 or 2% max. Si	23.00c.	23.40c.	23.65c.
0.15% max. C, 1 or 2% max. Si	22.00c.	22.40c.	22.65c.
0.30% max. C, 1 or 2% max. Si	21.00c.	21.40c.	21.65c.
0.50% max. C, 1 or 2% max. Si	20.00c.	20.40c.	20.65c.
0.75% max. C, 7.00% max. Si	16.00c.	16.40c.	16.65c.

Ferrochrome Briquets

Contract prices per lb. of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 60 per cent contained chromium. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	8.25c.	8.55c.	8.95c.
Ton lots	8.75c.	9.25c.	10.75c.
Less ton lots	9.00c.	9.50c.	11.00c.

Ferromanganese Briquets

Contract prices per lb. of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 66 per cent contained manganese. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	6.05c.	6.30c.	6.60c.
Ton lots	6.65c.	7.55c.	8.55c.
Less ton lots	6.80c.	7.80c.	8.80c.

Calcium—Manganese—Silicon

Contract prices per lb. of alloy, lump size, f.o.b. shipping point, freight allowed to destination.

16-20% Ca, 14-18% Mn, 53-59% Si. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carloads	15.50c.	16.00c.	18.05c.
Ton lots	16.50c.	17.35c.	19.10c.
Less ton lots	17.00c.	17.35c.	19.60c.

Calcium Metal

Eastern zone contract prices per lb. of metal, f.o.b. shipping point, freight allowed to destination. Add 5c. for spot sales. Add 0.9c. for Central Zone; 0.49c. for Western Zone.

	Cast	Turnings	Distilled
Ton lots	$1.80	$2.30	$5.00
Less ton lots	2.30	2.80	5.75

Chromium—Copper

Contract price per lb. of alloy, f.o.b. Niagara Falls, freight allowed east of the Mississippi River. 8-11% Cr, 88-90% Cu, 1.00% max. Fe, 0.50% max. Si. Add 2c. for spot sales.

Shot or ingot	45c.

Ferroboron

Contract prices per lb. of alloy, f.o.b. shipping point, freight allowed to destination. Add 5c. for spot sales. 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C.

	Eastern Zone	Central Zone	Western Zone
Ton lots	$1.20	$1.2075	$1.229
Less ton lots	1.30	1.3075	1.329

Manganese—Boron

Contract prices per lb. of alloy, f.o.b. shipping point, freight charges allowed. Add 5c. for spot sales.

75.00% Mn, 15-20% B, 5% max. Fe, 1.50% max. Si, 3.00% max. C.

	Eastern Zone	Central Zone	Western Zone
Ton lots	$1.89	$1.903	$1.935
Less ton lots	2.01	2.023	2.055

Nickel—Boron

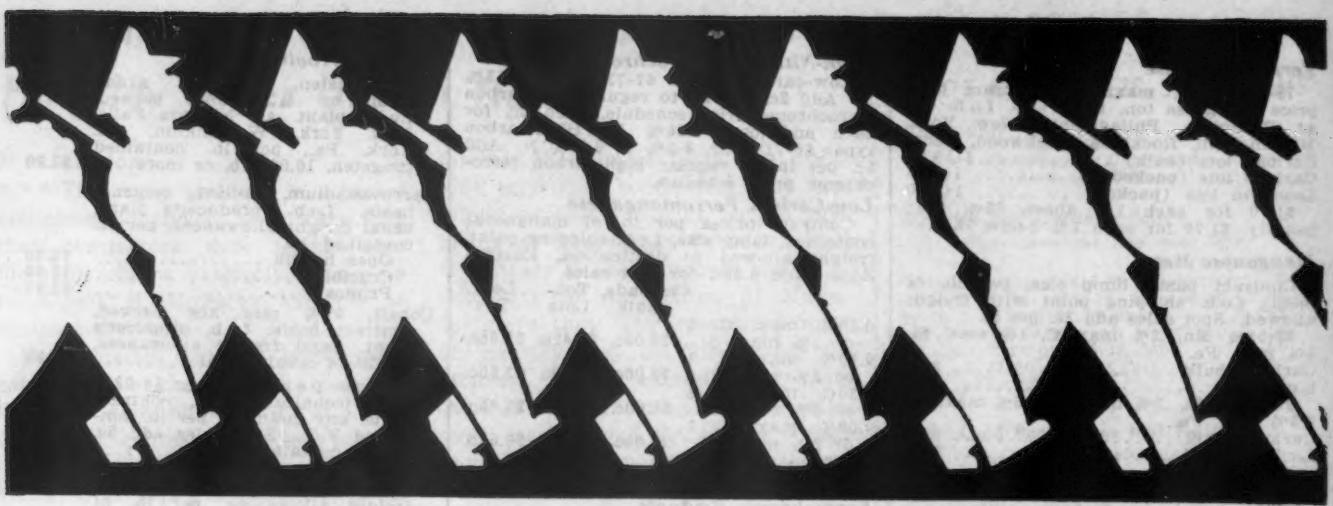
Spot and contract prices per lb. of alloy, f.o.b. shipping point, freight allowed to destination.

15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, balance Ni.

	Eastern Zone	Central Zone	Western Zone
11,200 lb. or more	$1.90	$1.9125	$1.9445
Ton lots	2.00	2.09125	2.0445
Less ton lots	2.10	2.1125	2.1445

Other Ferroalloys

Ferrotungsten, Standard grade lump or ¼X down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa. York, Pa., per lb. contained tungsten, 10,000 lb. or more	$1.90
Ferrovanadium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. contained Va.	
Open hearth	$2.70
Crucible	$2.80
Primos	$2.90
Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal	$1.50
Vanadium pentoxide, 88-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5. Spot sales add 5c. per lb. contained V_2O_5	$1.10
Silcaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)	
Carload lots	25c.
2000 lb. to carload	26c.
Silvaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)	
Carload lots	58c.
2000 lb. to carload	59c.
Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis	
No. 1	87.5c.
No. 6	60c.
No. 79	45c.
Bortram, f.o.b. Niagara Falls	
Ton lots, per lb.	45c.
Less ton lots, per lb.	50c.
Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb. contained Cb.	
2000 lb. lots	$2.35
Under 2000 lb. lots	$2.30
Ferrotitanium, 40-45%, 0.10% C. max. f.o.b. Niagara Falls, N. Y., ton lots, per lb. contained Ti	$1.23
Less ton lots	$1.25
Ferrotitanium, 20-25%, 0.10% C. max., ton lots, per lb. contained titanium	$1.35
Less ton lots	$1.40
High-carbon ferrotitanium, 15%-20%, 6-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y. freight allowed East of Mississippi River, north of Baltimore and St. Louis, per carload	$142.50
Ferrophosphorus, 18% electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equalled with Rockdale, Tenn., per gross ton	58.50
Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Sigio), Tenn., $3 unitage freight equalized with Nashville, per gross ton	$75.00
Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo.	95c.
Calcium molybdate, 40-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo.	80c.
Molybdenum oxide briquets, 48-52% Mo. f.ob. Langeloth, Pa. per lb. contained Mo	80c.
Molybdenum oxide, in cans, f.o.b Langeloth and Washington, Pa. per lb. contained Mo	80c.
Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add ¼c. for spot sales	
Carload lots	14c.
Zirconium, 12-15%, contract basis, lump f.o.b. plant usual freight allowances, per lb. of alloy	
Carload, bulk	4.6c.
Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk	5.75c.
Ton lots	7.25c.
Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.	
Car lots	8.00c.
Ton lots	8.75c.
Less ton lots	9.25c.



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Knurling of Socket Screws originated with "Unbrako" years ago.

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The Knurled "UNBRAKO" Socket Cap Screw shown at left is popular with mechanics. Even oily fingers get a non-skid grip on it—screw it in faster and farther before a wrench is needed.

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Sizes in these two screws: No. 4 to 1½" diameter—full range of lengths.

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